TEACHERS COLLEGE RECORD

Vol. XII SEPTEMBER, 1911 No. 4

# INDUSTRIAL ARTS EDUCATION AND INDUSTRIAL TRAINING

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## I. The Problem Stated

The vitality of the public education system of the United States is receiving ample demonstration in the adjustments and extensions it is now everywhere making to incorporate the ideas and programme of industrial education. Educators realize that systems if vital must change, must grow, must specialize; and our system of education is fortunately so vital and responsive that it is ready to develop to meet the new demonstrated needs.

Education, we realize, is not the fixed thing that some people would have it. It has never been a fixed thing. It must seek to meet the demands of life, and every age has changed its material of education, and changed it under the pressure of the changing nature and demands of social and economic life. To-day, over this whole continent, education is seeking, too slowly, perhaps, to adjust itself to the life of our own time, the life of a great industrial community; the curriculum of ten years ago is obsolete, or ought to be, to-day. The adjustments that have taken visible form in the work we call manual training, domestic science, domestic art, and so on, at first seemed to be merely a demand for "the practical" in education; they are now seen to be a clearer recognition of right method in education, of the

facts and values of child development, and of the shortcomings of our educational system. That is what lies behind the new education to give it what we begin to realize is a revolutionary force.

The root of the matter is that the public school system of the United States is not adequately efficient as an educative force. For reasons of faulty administration, indifference of parents and children, lack of adequate motive in instruction, the hardship of economic conditions, the public school system does not yet reach and hold the children it is provided to instruct. Even where it is best organized and administered, say in cities with a population of 25,000 or over, approximately half the children who enter are scholastically dead at the end of the seventh grade; a third of them enter the high school, and about one-twentieth actually graduate.

To put this generalization more definitely: Professor Thorndike[1] has shown that, in 1900, in cities of 25,000 and over, out of one hundred eight-year-old pupils living long enough, the number retained till any given age is as follows:

SCHOOL LONGEVITY—PER CENT

| AGE | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|
| PER CENT | 100 | 98 | 97 | 88 | 70 | 47 | 30 | 16.5 | 8.5 |

SCHOOL MORTALITY—PER CENT

| | | 2 | 3 | 12 | 30 | 53 | 70 | 83.5 | 91.5 |
|---|---|---|---|---|---|---|---|---|---|

During the last ten years we have increased the school longevity up to the fourteenth year by about five per cent.[2]

This showing is the more unsatisfactory because of the grade of instruction with which the "eliminated" pupils leave school. A considerable percentage of pupils are retarded in the normal annual passage through a given grade, so that many pupils who leave at thirteen, fourteen, and fifteen have not got beyond

[1] *Elimination of Pupils by Schools.* Bulletin No. 379 of the U. S. Bureau of Education. By E. L. Thorndike.

[2] *Age and Grade Census.* Bulletin No. 451 (No. 5, 1911). By George D. Strayer.

the fifth, the sixth, or the seventh grade respectively. Professor Strayer finds that the ratio of pupils in the sixth, seventh, and eighth grades to those entering school in a given year is 73, 55, 42 respectively. The percentage completing the grade is naturally smaller. The total result is that over half the pupils in the cities of the class investigated leave school with less than a full elementary education. When we consider that these statistics are based on school systems in cities with conditions most conducive to scholastic longevity, we may be safe in concluding that the country as a whole will make a worse showing than is here stated.

This school mortality is due, in part, to economic pressure, though less so than is currently believed. The main reason is that the material, method, and direction of elementary education repel all pupils whose aptitudes and interests differ from those of the orthodox schoolroom, and repel them in increasing numbers as pupils grow in consciousness of their powers and likings.

The truth is that the material and method of our instruction are still predominantly abstract, and need to be made more concrete, more real, more vital. Our public school curriculum is still predominantly the product of a philosophy and an economic system (of which I shall speak later) that are both out of date. To separate the child in school from all his natural activities and environment, to train him through abstractions, chiefly to interpret and use symbols of reading, writing, and arithmetic, to teach subjects of instruction, not as related to the child's mind or life or future vocation, but after an order or classification of their own—that is the school practice which modern school reformers have not yet succeeded in breaking down. The kindergarten, the manual training movement, the household arts movement, the vocational education movement have all been powerful centres for the diffusion of new conceptions of methods and material of elementary and secondary education. The older practice is, it is true, somewhat modified, but in the main it still persists.

The result is that the child is still largely sacrificed to the curriculum. The progress of the child is determined by graded stages of abstract studies, so constructed that the interests of the

lower grades are subordinated to the higher, and at the end thereof the needs of the college dominate the whole. The new education demands now for the child that his whole life shall be taken stock of; that education shall concern itself with all his nascent powers, realizing that children are as diversified among themselves in abilities, occupations, aptitudes, tastes, as men and women are among themselves; that the school life of the child shall be his fullest and best life, guiding, prompting and lifting his developing personality in its best representative activities; that at each new grade the education of the child shall be considered afresh, and children taught to do and make and know what they then really want to know and make and do. The new education would trust a little more to the child's irresistible impulse of imitation and invention, and a little less to the schemata of the mathematician and grammarian. It holds, in short, that school life should be less formal and more vital, more organic, leading through interest to efficiency.

The need of efficiency as distinct from proficiency has brought on the present movement of vocational training. American public education, we admit, has not yet in any broad and adequate way concerned itself with vocational training. Its ideal has been a certain conception of culture possible to all children. That symbol learning took a supreme place in this ideal was owing doubtless as much to a desire to get a lowest common measure of subject matter as to the continuing tradition of humanistic education. When trades were taught in the trades, the learning of the book, commonly regarded, in spite of many protesters from Rousseau to Ruskin, as education, was a supplementary matter, useful and broadening, no doubt, and above all giving prestige, but in the practice of livelihood, incidental. On this basis, with a certain aloofness from the occupations of men and women, devoted at its best to things of the intelligence and the spirit, the public elementary school, free, universal and obligatory was founded, and on the basis of the day elementary school the day secondary school was subsequently developed. If the idea arose of the relation of education to life and practice, it remained a narrow idea, fitting only the few and exceptional, children for the most part of the well-to-do, destined for the colleges and professions; the many who were not of that class

kept slipping off the ladder, disappearing from the school register, with only the requiescent inscription of "gone to work." We realize now that in practice something interferes with the success of a scheme, in the abstract so perfect,—that offers the child virtually free education from his sixth to his eighteenth year, and that ends as we have seen with half the children gone after the middle of the game and nineteen-twentieths by the end.

This educational system so constituted, the world is now questioning, with increasing insistence: *Do you prepare for life and livelihood?* And the system, uttering inconsequentialities about discipline and culture, ends by owning that *It doesn't, never did, and never was meant to.* And yet the primary question with every man is livelihood. Can we not recognize the worth and dignity of vocational purpose in education, in which is an asset of the highest educational value? Can we not realize also that in the present economic system children must at an early age begin to earn their living and that this necessity does not lessen the obligation of public education for their training; but that for these and for all we must plan and provide with even greater care than we plan and provide for the few who now alone continue at school.

For these reasons: the falling away of school attendance, the abstract instead of the concrete approach in school method, the subordination of the child to the curriculum instead of the curriculum to the child nature, the lack of vocational training—a criticism is being applied to the product of our system of public instruction such as heretofore has never been applied. We ask to-day: Does our public education give us in any adequate measure social and industrial efficiency? And the answer comes from all sides—from every grade of life and calling—that our public educational system is lacking: it does not adequately make for faculty—for the intelligence, power and will to do things, and it does not make for efficiency, which is that faculty trained for the particular needs of a complex civilization.

## II. The Programme of Industrial Education Stated

This state of affairs, we hold, is deplorable, and, because it is capable of remedy, should be cured. On the one hand we

must hold more children at school by offering a more real education—instruction that enlists interest and attention—the basis of mental growth. On the other hand we must differentiate the types of education to provide vocational education. The changes being or to be made, which constitute the programme of the new education, are briefly these:

*I. The revision of the elementary school studies in material and method to provide for the full recognition of the constructive and artistic activities of children; to use and train mental activity with respect to science, tools, machinery, processes, in preparation for the modern world they are to take a place in; to cultivate an appreciation of the domestic and the industrial, or commercial, or agricultural environment of the child's life—the great realities that surround him.*

*II. The differentiation of the secondary school to provide, as fairly and adequately as we now provide collegiate preparation, courses of instruction for such as will enter the field of agriculture, or commerce, or the scientific or mechanic arts, or the home.*

*III. The provision in public education for vocational training as fully and freely as we now provide any other type of secondary education and as diversified as the local community life demands.*

*This vocational organization shall take cognizance of economic facts and industrial needs and be ready to meet conditions by happy adjustments, operating by day or night, now through trade schools, again through co-operative and continuation schools, through monotechnical, or polytechnical, commercial, agricultural, art-industrial schools.*

Not to encroach on but to revise this public school system, not to weaken its ample elements of good, but to strengthen and vitalize them, not to diminish the scope of public education, but to enlarge and diversify that scope—such is the purpose of the new movement that is named industrial or technical or vocational education. For American public education it is nothing short of the discovery of another hemisphere of educational activity.

Let us consider this programme in its broad aspects:

## III. Industrial Arts Education and the Elementary School

The present state of national education is a natural evolution of the type idea in which our state systems started. The public elementary school began in the United States before the advent of the railroad and before the factory had made over the conditions of industrial education. The apprenticeship system, admirably suited to the small shop, the agricultural system with unlimited supply of free land, provided easy and natural means for sons to acquire callings they saw everywhere practiced about them. The boy got his feeling for industrial life from the near-at-hand. The blacksmith shop, saw-mill, grist-mill—they were daily realities to him. The miscellaneous activity of artisans in rather isolated communities called out that all-round knack and handiness that characterized the old-type American mechanic.

Education meant merely a supplementary thing, to be got before the serious training for vocation began. It did not need to concern itself with vocational education—that was provided in the steps of the vocation itself. It offered a general and supplementary training only slightly related to the vocations. Thus there was a balance and a measure of completeness in the total result that tempts one to regard the last generation of workmen as a very fine type of industrial manhood.

Our public school system has thus been constructed and developed on two suppositions—one, that vocations could be learned adequately in the vocations, and therefore public education had no concern with vocational training. The second supposition was that the best, or only possible, training given by the state was a general academic education. Accompanying this was the secondary supposition that a school system that provided the pupil in day-time hours with free education, from his sixth till the eighteenth year, fulfilled the whole need and duty of the community in the matter of instruction.

To establish such a system was a generous and honorable provision of which the nation may be proud. But to-day both suppositions, in our present economic conditions, are, if not false, in so small part true, that an educational system like that of the United States, based on them, is, with regard to the training of the nation and the realizations of education in other countries, both inadequate and in a large measure misdirected.

The question concerns first the elementary school. In recent years the most vital changes in material and method of instruction in the elementary school have come from the ideas and methods of industrial arts education. Elements of industrial education are already in elementary schools of the better type—drawing, clay modelling, wood working; something done in physics, nature study, commercial geography; here and there we find metal-working, dressmaking and cookery, and would find them in all schools, probably, if people would stop thinking of education as expense. Education, real education, it should never be forgotten, is not expense, but investment.

These elements are already in many elementary schools; but many people are at sea in the bearings of the whole matter; as some one has phrased it: the idea of industrial education is to put blisters on the hands instead of on the mind. The basis of the new education is very different. The true basis for the new education in the elementary school lies in the nature of child thinking. Child thinking is essentially objective. It prefers seeing and handling a thing to mere talking about it. It prefers doing the thing to mere hearing about it. That is a principle, also, for much of our higher instruction—the laboratory and shop method of science and engineering. But it is the indispensable method in childhood and in the education of the child. The child thinks most when he plans what he is interested in doing.

The presence of subjects of industrial arts in the elementary schools is determined by this and many other reasons. In the first place they offer the concrete as the basis of study—the most favorable teaching material and the best approach to abstract knowledge. Then, they offer the opportunity for constructive activities, mechanical and artistic. Again, they offer a natural centre of correlation of many school subjects; arithmetic and geography, for example, get more definite content by association with industrial arts subjects. They offer, too, the natural introduction, historical and social, to the life of an industrial community to which the pupil belongs. The average natural aptitudes and interests of the child find expression here, as, at this stage, they find expression in no other subjects; they test aptitudes hitherto neglected.

The old education worked essentially with the abstract. Spelling was and is but conventional forms, reading was but words, geography but names and space relations. In our new education we aim to hold fast what is good in the old, but also to bring into every elementary schoolroom from the first primary grade on, material of the concrete—the daily realities of the child's life and thought. We choose primary materials—foods, textiles, clay, wood, metal—the basic materials of industrial use—as the materials to talk about. What a world of knowledge, of history, of invention, of art, of manufacture, of commerce lies there exciting the child's interest. We use the basic processes of industry, as modelling, wood-working, metal-working, weaving, sewing, cooking as the projects for the child's activity. We are not afraid to deal in hygiene when food is involved, or nature study or commercial geography when wood or wheat is mentioned. And we teach drawing, the A, B, C of all the arts, and design where we can apply art to projects.

Thus we inculcate habits of industrial thinking and practice on what concerns the child. We use that love of tools and tinkering and doing things—instinctive, God be thanked!—in every boy and girl,—that wonderful curiosity about the world, opening up everywhere about the child, wonderful beyond Aladdin's palace.

I have a vision of an elementary schoolroom. It is not by choice the vision of the schoolroom of my own childhood,—the formal rows of seats, the bare ugly walls and windows, the languid youngsters, droning over abstractions, under the guidance of an antiquated, 'acidulous vestal.' It is rather the vision of schoolrooms that make you think of the corner of a brick-yard, kitchen, sewing-room, foundry, blacksmith-shop, carpenter-shop, aquarium, terrarium, herbarium, library—the windows open on the school garden, and the teacher—well, someone who can do things.

At this time we need experimentation in education. We have had thousands of schools working on the basis of formal studies; we need now to test the new method by elementary schools that are put frankly and fully on the basis of concrete and constructive studies with the formal studies related to them and approached through them. He who heareth the word and doeth it, buildeth his house upon a rock.

That is the pedagogy of the question. There is also the practical end of the new education. It offers an adjustment of the school to life. Surely insight and experience in industrial conditions are obligatory in all who dwell in an industrial world.

Other nations see that: household and industrial arts are a part of the curriculum of every other civilized nation. Every modern European nation makes domestic science and domestic art—foods and cookery and houshold management, sewing, repairing, garment-making,—an integral part of elementary education. The most advanced nations make wood-working and metal-working, physics and chemistry a part of public elementary education.

There is no longer any question over household arts in the elementary school. What was thought at first a fad has become a fixture. Here in America our household arts education shows how our schools can face the hardest task now put upon the nation. In the home the standard of life is going up—the preparation and variety of food, the sanitation of the house, style in dress, the decoration of the home,—and hired help is impossible. The children are being taught to do their share. A stamp of worth has been put upon service in the household by teaching household arts in the school. Mothers have now less need to sacrifice themselves, standing between the children and housework to get for their children more time for the school work. The school can now contribute its part to the efficiency of the home by diffusing ideas of hygiene, sanitation, and domestic economy; the efficient home can contribute to the preparatory industrial training of the children by having them interested workers in the household. Make this form of the new education universal, and we shall have improved the standard and lowered the cost of living throughout the nation.

In the same way the industrial arts subjects are a preparation for industrial life. They are not a trade preparation so much as a preparation of the understanding, the spirit, the habit. They cultivate familiarity with tools, the mental and physical co-ordinations called for in all industrial manipulation; they develop industrial intelligence and lend dignity to labor. They are the means and the only means now available for diffusing an interest in form and color, in a word, in beauty; and so

through them we can do something to remedy that incredible lack of taste that marks a nation that has lost the traditions of art in all its industries.

Such subjects to be adequate must be guarded against two dangers—lack of content of ideas, which manual training has suffered from, in restricting shopwork to manipulation; and the prevalence of caste conceptions of propriety by which all girls are assigned to needlework and all boys to bench work. The tools should be to those that can handled them.

## IV. Industrial Arts Education and the Secondary School

A percentage—estimated as high as forty—of the pupils of the elementary school enter the high school. Is our high school education all that it should be? Revolution is now beating on the walls of every high school in our land. During the last two years thirty-two high schools of New York State have differentiated from the old-line type and put in household arts, agriculture, and shop work into their curriculum on a par with old-time subjects. But the old-line type is still the predominant type everywhere. No matter what the interest or destination of the pupil, whether the high school is in a farming, or a commercial, or an industrial community, the high school in the main is still the machine of the College Entrance examinations—hide-bound, even if the binding is literary morocco. The high school should prepare for college. It is a necessary type, and I would not sacrifice one of the types of education that we have; hold fast that which is good. We should educate for college those who will go to college—even if the percentage is but six; but we should educate also for life and livelihood those who must soon earn their living.

We want not one type but at least six types of high school courses—schools that are in key with their environment—that look to college and to technical schools, to agriculture, to commerce, to industry, to home economics.

In the second paper of this series, Professor Bonser takes up the modifications of our present school curriculum with special reference to industrial training, and the history and pedagogy of the movement are given there a special consideration.

## V. Public Education and Industrial Training

That public education should concern itself with vocational training is a proposition easy of demonstration. In the first place, it is the natural evolution of public education. Specialization and complexity or intensification are the marks of evolutionary progress. This progress appears in all phases of industrial and social life. The family, once an industrial as well as a social nexus, has lost nearly all its industrial occupations to the shop, the factory, and the store. The primitive farm has specialized and grown intensive and complex in narrower fields with the dairy, truck, fruit, or grain as the objective. The metal-working trades, the outgrowth of simple blacksmithing, have become infinitely diversified, employing a host of specialized workers and an innumerable array of special machines. The manifold social activities of the Church, in teaching, healing the sick, caring for the poor, have resolved themselves in many cases into specialized activities in public educational systems, hospitals, asylums, entirely free from the institution by which at first they were mothered. The whole movement of a national economy moves up from producing raw materials to producing also manufactures, from crude manufacture to fine, from life on a primitive plane to the complexities and interrelations of highly organized civilization.

Should our public educational system share in this evolutionary progress? Should it differentiate and specialize to meet the needs of the industrial community it purports to serve? Or, should it continue to treat the child as it for the most part has hitherto treated it, as a being, spiritual, absolute, isolated, to be developed mainly by abstractions to some idealistic destiny?

In the training offered for professional careers, education has already specialized. The professions of teaching, the church, medicine, including surgery and dentistry, law, engineering—mechanical, electrical, and chemical, military and naval science, agriculture, are all to-day entered best through schools, and these schools are with the exception of the church, unless otherwise provided by private-public foundations, founded and administered by the state or nation. We take this kind of specialized education, though almost every type is comparatively recent, already as a matter of course. The responsibility of the state

for technical education to meet all industrial needs has been so long acknowledged in practice by advanced European nations that Europe takes this part of the state's duty now also as a matter of course.

Private initiative in the United States has already provided a measure of specialized training in institutions such as business schools, schools of applied design, of mechanical and domestic arts. It is a law of institutional growth that private initiative in education is the forerunner of state action. What has been done sporadically, chiefly for private gain, can by the state be done broadly and for the public good.

The basis of a plea for universal industrial training by the state is that such training is the greatest factor in industrial efficiency and that no other organization can adequately furnish it.

Our dependence on private initiative for education for practical efficiency has resulted in vast areas of inefficiency; in training we are behind Europe and behind our necessities. Our public press teems with interviews, reports and articles to the uniform effect—our farms are badly worked, our food is badly inspected, our artisans are inadequately trained, skilled foremen are hard to find, and the scrap heap is too big; our wares in innumerable articles of commerce are beaten in the world market: the problem of living—the totality of it all—cries out from every home in the land—in this land, the most favorably placed for comfort, health, good government, under God's sky.

The thing we lack almost everywhere is efficiency; or, if we get it, we get it at too great a cost. Now three-fourths of this matter of efficiency is training, that is, applied education. In the professions we realize that. In the professions we have already manifested our faith in works—we have our highly efficient schools of medicine, surgery, pedagogy, engineering, art, architecture, military science, naval science. They have given us efficiency in the lines intended. It is obvious now to expect efficiency through schools and institutions in our teachers, physicians, surgeons, architects, engineers, officers of the army and navy; it is equally obvious that we might expect to promote efficiency in all other workers by education—in our farmers, our artisans, our foremen, designers, salesmen, build-

ers, in our homes, and in our municipal administration. Think of the question of municipal administration. Every city in the land is fighting for decent administration and cannot get it. Hundreds of thousands of dollars are spent in every great city at every election in a vain effort for reform. We have not yet one school of municipal administration in the land; some day we shall train municipal officials, and the result will be worth notice.

We cannot get efficiency without training. That is one of the obvious things we don't see. Efficiency has come to mean to-day a very complex thing, and the training for it a very complex thing. The Industrial Revolution absolutely wiped out the old hand-industry as a commercial factor. It harnessed the steam-engine to the spinning-wheel and the loom, and one man plus the machine does the old work of hundreds of hand-workers. It harnessed the steam-engine to the cart and carriage and boat, and brought the wheatfields of Russia and North America nearer London than was Yorkshire. And great industries like agriculture, shipbuilding, paper-making, refining of sugar or oil—have been revolutionized by the application of science. Other industries—the building industry in its higher forms, furniture making, printing, textiles, ceramics, involve the application of art in highly specialized forms, and the tradition of art disappeared with the old hand-worker. Modern industry, then, is refounded on the application of the machine, of science, and of art and organization to production.

The old apprentice system with its close relation of learner and craft-master, in which the master's obligation to teach was enforceable by law and penalties, did well in hand-industry and the master's workshop. But the factory system altered the relationship, and in the adjustments following the spread of the factory system, the employer's obligation to teach has somehow got lost in the shuffle. And yet the need for trained intelligence, knowledge of machinery, of science and art, has kept rising with every advance and specialization of industry. What must education do? On the one side at present we have general academic education, on the other side we have specialized pursuits which the learner must pick up as best he can. Between the education of the school and the specialized pursuit

there is no connection, no bridge. And the bridge that is needed is specialized industrial education.

Abroad they have a wider eye to the economic value of specialized education and do things differently.

Abroad, we see training and efficiency go hand in hand. In the countries where technical education is most highly developed efficiency strikes you at every turn: the cleanliness of the streets; the even, quiet movement of the street-cars; the perfection of machines; the artistic lines and durable construction of the houses, the beauty of the stained glass, the quality and design of the linoleum you walk on; the planning of city extensions, of garden cities; the wealth of industrial countries like England, Belgium, France, Germany, the revival of Italian commerce. In Italy, the movement of technical education is now turning the convents and palaces and fortresses of the middle ages into art-industrial schools and museums. In Prato you pass from the work of Donatello and della Robbia to the vital life to-day, under new conditions of industry, of the Profesional School of Dyeing and Weaving. In the Castello of Milan, once the stronghold of the Sforzas, now reign the school director and the curator. You get the conviction driven home and pressed in, that behind all that you see and experience, behind the whole movement for the betterment of the nations wherever you go in Europe, *the new directing force is technical education.*

On the one hand there is the striving to create and apply beauty to industry; on the other to increase efficiency in every line of production. And the total result is that mere living itself is better organized, is moving to a higher plane.

Education abroad has specialized to meet conditions. Every state—Germany, Switzerland, Holland, Belgium, Scotland, Ireland, England, Austria, France, Italy—looks upon this vocational training as a public obligation, as much an obligation as public elementary or public secondary education. And they put it as a rule not in charge of the Minister of Education, but the Minister of Trade, Commerce, and Agriculture. And this education is already in the main universal and compulsory, or is getting to be as rapidly as ministers of trade, commerce and agriculture can make it. So they adjust education to the present demands of life and economic conditions.

Everywhere in Europe technical education is regarded as an essential factor in industrial efficiency. To develop a new industry or to revive one that is languishing they institute schools for the industry. We raise the tariff; they raise schools. The Swiss make the most perfect watches; the oldest technical trade school is said to be the School for Watch-making of Geneva. German chemical industries lead the world; the dyes of the textile industries, the colors of the artist, the inks for fine printing, especially color-printing, are German: Germany has over six thousand school-trained chemists in her chemical industries. The industrial rehabilitation of Italy is accompanied by the parallel establishment of technical schools, for the soap industry, for the paper industry in Milan, for the textile industry at Prato, for the art industries at Rome, Florence, Venice, Milan, for mechanic arts in every important town. But Germany is the most remarkable example among all the nations, of the immediate economic benefits of specialized education applied to the needs of a newly developing nation.

The evolution of Germany as an industrial nation of the first rank has come about virtually in our own day and generation. What are the factors in this evolution? The soil of Germany is not naturally rich nor is her coal of the best quality; but her technical schools are. In the matter of education for industrial purposes Germany has been able to think socially and nationally. She learned industrial processes from Great Britain; she borrowed the idea of technical schools from France and Switzerland. On the basis, first of evening drawing schools, she built up her education of the artisan. Not abandoning the system of apprenticeship, she met new conditions by increasing the training offered by the state as the training offered in the trades decreased. To-day it may be said that throughout the length and breadth of the German Empire the state offers all the technical instruction supplementary to the trade, needed in all vocations—whether it is the design of the stained-glass worker, the chemistry of the dyer, the bookkeeping (business practice) of the shoemaker, the French of the hotel waiter. Every apprentice, boy or girl, from fourteen years of age, is in state-directed schools for from six to eleven hours a week throughout the years of his apprenticeship; and his certificates as journeyman

and as master craftsman are issued according to state standards, by the state. A city system of industrial education such as Munich covers the courses suited to sixty-seven trades, while that of Berlin provides for two hundred and twenty-three trades. And this education is not merely technical, it includes the hygiene, the civics and the law that concern every workman as a man and a citizen. The way of the school superintendent in Germany is not simple, but then he is free from politics.

As the state looks after the artisan and housekeeper, so it provides for the master workman, the foreman, the manager, the contractor, the builder, the expert technician, the chemist, the designer, the draftsman, the salesman. Germany has state schools for the ceramic industries; schools for the higher woodworking industries; for the building trades; for the textile industries; for mechanical and electrical engineering trades; for the chemical industries; for watchmaking, shipbuilding, soap, paper, optical instruments, hotelkeeping, automobiles, beer. They serve as day schools for experts and part-time day or night or Sunday schools for the apprentices.

The provision for art industrial education is almost as marked as the provision for industrial education. There are thirty-four art-industrial schools of the first grade. These schools have size and equipment adequate to the immense field of art applied to industry. We have no building for art-industrial education in all the United States to compare in beauty and extent with the Art-Industrial School of Berlin or of Dresden. The Academy of Graphic Arts of Leipzic embraces all the trades that centre in the production of the printed paper and the book; it has the dignity, the equipment and thoroughness of our best colleges and schools of engineering. The School of Photography of Munich (Lehr-und Versuchsanstalt für Photographie, Chemigraphie, Lichtdruck, und Gravüre) rivals the Leipzic school in the thoroughgoing intelligence of its organization, in completeness of vision and equipment for its peculiar field.

To supplement these schools with demonstration material they have industrial and art-industrial museums like the Deutsches Museum and Bavarian National Museum of Munich, museums that every city seeks to possess and enrich, for which money

and brains have been spent like water, that are revelations of beauty and interest, the stimulus of the students of the adjacent schools.

The provision for commercial education is equally widespread and thorough and equally well graded and organized.

And beyond these for the highest training of the engineers and commercial experts are the technical universities (technische Hochschulen) and commercial universities.

Here is the table of the German system,—based in the main on Dr. Rose's voluminous reports.[1]

| | | |
|---|---|---|
| HIGHER TECHNICAL EDUCATION | [UNIVERSITIES ..... 22]<br>TECHNICAL UNIVERSITIES ..... 11<br>COMMERCIAL UNIVERSITIES ..... 5 | Application of highest scientific knowledge to the purposes of the industrial arts. |
| MIDDLE TECHNICAL EDUCATION | SCHOOLS OF:<br>Agriculture ..... 11<br>Art–Industries ..... 34<br>Building and Engineering Trades .... 52<br>Ceramic Industries ..... 4<br>Commerce ..... 429<br>Forestry ..... 5<br>Metal Industries ..... 12<br>Mining and Metallurgy (Prussia alone) 10<br>Naval Architecture and Engineering . 2<br>Navigation ..... 19<br>Ship Engineers ..... 8<br>Textile Industries—45 (higher), 58 (lower) ..... 103<br>Woodworking Industries ..... 12<br><br>MISCELLANEOUS SCHOOLS—Basket-makers, glass-stainers, bootmakers, photographers, tailors, musical instrument makers, toy industry, millers, book printing, innkeepers, gilders, ivory workers, cabinet makers, special instrument makers, tanners, etc. | For technical experts, foremen, superintendents, owners, managers, salesmen, etc. |
| LOWER TECHNICAL EDUCATION | CONTINUATION SCHOOLS (FORTBILDUNGSSCHULEN)<br>Universal and in general obligatory throughout every community of the German Empire .....13,652[2] | For apprentice artisans and operatives; in part for journeymen and master workmen. |

[1] Technical Schools of Germany. Diplomatic and Consular Reports, Nos. 561, 566, 572, 573, 594–7, 600–3, 608, 609, 611, 615, 618, 619, 630. Published by the British Foreign Office.

[2] Ware, *Educational Institutions of Trade and Industry*, p. 130. (The number stated is for 1898-9.)

In forty years, virtually the period of developing technical education in Germany, Germany has seen its policy turn a poor country into a rich one, the most powerful of Europe. I asked a German agent for German manufactures in London—"To what do you attribute the tremendous industrial development of Germany?" "I admit," I said, "the tenacity, the power of organization and co-operation of the German race. What," I asked, "is there beyond that?" His reply was "Technical education."

I questioned here and there in Switzerland, Holland, and Belgium, various men in industrial callings as to the value they attached to technical instruction given to artisans as well as to industrial experts. They had but one reply: *It is indispensable; our condition without it is unthinkable.*

## VI. Organization of Industrial Education in the United States.[1]

Does the United States need a system of industrial education such as Germany and other modern European nations possess? Public opinion is practically unanimous in holding that we are forced to undertake its foundation as a basis and guarantee of industrial efficiency. Private initiative has already done much in the highest field and something in the middle field; a few railroads, departmental stores, industrial companies have already established their own corporation schools; a few other companies co-operate with existing schools; labor organizations have in some cases founded schools for their own members. We have come to take for granted that short-course instruction in commercial and trade lines is a peculiar field of private business schools and the Young Men's Christian Association. But, in general, the artisan is at his wits' end to get more technical training; in the main he cannot get it, or he gets it—a little—by letter, from Scranton, Pa. This activity, these schools, are a credit to our clerks and artisans; they are a reproach to our public educational system; in all, they are confessedly partial

[1] A summary review of typical schools for industrial, commercial, and household arts in Europe and the United States, and of certain city and national systems of technical education, will be undertaken by the Schools of Household and Industrial Arts of Teachers College and issued separately during the current academic year.

and hopelessly inadequate. We are now ready to turn this pioneer endeavor rapidly into organic form in the system of public education.

State legislation and state action now make possible public industrial education in Massachusetts, Connecticut, Georgia, Indiana, Kansas, Nevada, New Jersey, New York, Ohio, Wisconsin.[1] Already public schools have been founded that formulate, as do similar schools of Europe, the present needs of industrial and commercial training. Schools that may be taken as typical of the varied organization by which industrial training can be made effective, are as follows:

1. *Elementary Trade and Commercial Schools*

The first need in vocational training is for the widespread establishment of elementary trade and commercial schools to provide adequately for boys and girls beyond the elementary school age, who are destined to enter the lower ranks of industrial and commercial work. The years from fourteen to sixteen are now with us the critical period of youth; children of this age are still too young for shop apprenticeship; they find little to hold them in the grammar grades or the academic high school; at present they drift into this or that casual employment or unskilled occupation, or into crime. The foundation of trade schools with diversified outlet into occupations would, as the success of the new trade schools of New York City shows, enlist the interest of the pupils and have the co-operation of parents and employers. The industrial arts work of the elementary school will afford the natural preparation for the elementary trade and commercial school.

Such schools are best that unite a minimum of general training with a maximum of vocational training. Subjects of instruction of a general character such as English, history, mathematics, science, household arts, hygiene, and civics should be consciously organized in method and material to meet the personal and vocational needs of the pupils. Subjects of vocational training should include, in part, training in one or more of the basic industrial callings, and, in part, in cities, in many call-

[1] National Society for the Promotion of Industrial Education, Bulletin No. 12, 1910.

ings that require short specialized preparation, so that the pupils may quickly be fitted to earn a livelihood. Trade academic subjects may be taught by selected academic teachers, but shop and office subjects must be taught by trade and office experts in adequate shops. The product of trade schools, for the sake of the efficiency of the schools, should be made on trade orders and sold.

2. *Co-operative and Part-time Industrial and Commercial Schools.*

The specialization of trade, the cost of equipment, the value of shop experience, the need of self-support of the wage-earning class will always limit the development of trade schools. The experience of foreign countries and American experiments in Cincinnati, Fitchburg, Beverly, the evening courses of the Trade Schools of New York, the Foreman School of the Lowell Institute, and our School of Industrial Arts show how readily technical education can be extended if our schools can offer advanced instruction specialized to meet the needs of trade and professional workers without detaching them from the occupations to which they owe their support. That type of training, so far given in this country mostly at night, will, no doubt, follow the development of similar instruction abroad, and be offered through co-operation with employers, more and more in the day hours. The infinite specialization of industry renders this the most difficult task of educational organization; abroad it has taken at least fifty years of elaboration to bring about the efficient condition we find in Zurich, Munich, or Berlin.

Legislation must direct school boards everywhere to establish such trade and continuation schools; the raising of the compulsory education age to sixteen years will rapidly follow. Through these two classes of schools lies our hope of having a trained artisan and commercial class of American birth.

3. *Middle Technical Schools*

Our highest schools of engineering and architecture provide more and more adequately for the highest class of professional and technical workers. But the men and women of the middle technical classes we neglect, and this class—the efficient instru-

ments of the engineer and the architect and the superintendent—is probably sixteen times as numerous as the highest class. In the city of London, the new provisions for technical education include one high engineering school, seven polytechnic schools (middle technical schools), and an equal number of art-industrial schools. What we have already done sporadically in the textile schools of Lowell and Philadelphia, in the technical schools like Pratt and Carnegie and our Schools of Industrial and Household Arts of Teachers College must be done with an aim and a system by state and nation, adequate to the greatness of our commercial, industrial, and household interests.

4. *Art-Industrial Schools*

Middle schools for those industries that depend in large measure on art for their character and value are a most urgent need in the United States. Schools of the art industries, such as the printing industries, the ceramic industries, the finer wood-working and metal-working industries, interior decoration, photography, have in foreign lands demonstrated their usefulness to an extent that stirs the American observer to admiring envy. Here the splendid gift of artistic inheritance that comes to us with our immigrants we waste and lose: the very boy who works in hammered brass in the elementary school to excite the teacher's surprise and commendation, is found next year driving a delivery cart. When we open up schools for the art-industries we shall have American-born artists in our industries. Then, perhaps, we may produce color prints to equal the Germans, and fabrics to equal the French, and porcelain to equal the English.

How the colleges will react from the pressure of vocational training it is not easy to foresee. That they will adjust themselves in part to the new demands is certain; but it is probable that before the adjustments are made, we shall have colleges of a new type established that will unite the so-called cultural studies with training in the technical arts.

5. *Libraries and Museums.*

In the provision of public libraries, we lead the world. The need of industrial and art industrial and commercial museums

has still to be recognized and supplied. What we have done for museums of fine arts needs to be done in every great city for the industries by which these cities live.

### 6. *Agricultural Schools*

The organization of state systems of agricultural education from the rural school to the agricultural college will parallel in every stage the organization of the industrial and commercial schools of the towns and cities. Progress in this field of education is already rapid.

### 7. *Training Schools for Teachers of Technical Arts*

The extension of programme of normal schools to include the subjects of industrial (including commercial), household arts, and agricultural education is proceeding apace and should be pressed on. Technical schools have everywhere a duty and opportunity to select and to train the expert workers who can also teach; on such men depends the success of our trade and co-operative and continuation schools. Teachers College has tried to be forehanded by instituting its Schools of Industrial and Household Arts, the chief end of which is the training of teachers of technical arts; but already the demand exceeds the supply.

## VII. Vocational Training a State Investment

This vocational training through schools has hitherto been the privilege mainly of the specially gifted or the specially fortunate; and in general this training has been confined to the professions, and the individual has had to pay for his training. We are ready now to think more broadly in this matter, and consider if national efficiency, which is a concern of the nation, can be provided for by state and nation; that the many to the measure of their ability and their needs, may have the training hitherto denied them; that we may utilize adequately our chief resources, the men and women of this land. The programme outlined above will take money; but it is, we insist, not expense, but investment. Investment by the individual in education is shown to be financially remunerative to the individual;[1] state investment in education is likewise demonstrably remunerative

[1] Person, *Industrial Education*, pp. 26–36.

to the state; there remains then this final state investment in state vocational education. That the burden is no more serious than that of any other type of secondary education is the main purport of Mr. Brandon's investigation, presented in the article that makes the third part of the present series.

The active participation of our national government in the institutions for furthering industrial betterment is already marked in many directions, especially in agriculture and science. The foundation of National Schools of Industrial Arts, paralleling the Ecoles des Arts et Métiers of France, would bring incalculable benefits to our industries, not only in training experts but in promoting research into materials and processes. This nation puts ten millions every few months into battleships and in a few years the battleships are junk; but the humble endowment of John Harvard, that began to work in 1636, is working still. The forts and battleships of the new industrial era are technical schools, and in the struggle for industrial supremacy ahead of us technical schools are more requisite than battleships. The future is to the new school-men and the new types of schools; for through vocational schools alone, in all their degrees and specialties, can we build for national efficiency.

To sum up: The new education aims to train our people to meet the problems of livelihood and living—to apply science and art, craft and machinery, method and organization to make possible a higher achievement of living for all. The great new stream of education must penetrate like a vast irrigation system through the land, pushing its rills into the remotest communities —as universal, as essential, as beneficent as the free elementary school. This is the latest and most measurable contribution of education to life. "That man only," said John Ruskin, "is educated, who is happy, busy, beneficent, and effective in the world." To that idea—that men and women may in this land be happy, busy, beneficent, and effective—the new movement of vocational education is devoted.

# MODIFICATIONS WITHIN PUBLIC OR GENERAL SCHOOL PROGRAMS TO MEET INDUSTRIAL NEEDS

By Frederick G. Bonser

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Until recently, wherever public support and control of education have developed, such education has been based upon the theory that it was supplementary to vocation. Its end point has been cultural or liberal. Until long after the Industrial Revolution, the numerous forms of apprenticeship training relieved the school from responsibility for any form of technical efficiency other than mastery of the "tool" subjects, the traditional three R's. The remoteness of school work from the larger problems of everyday life produced a conservatism among schoolmasters and school authorities making readjustment to new demands slow and difficult. Notwithstanding this, however, gradual and fundamental attempts at readjustment have taken place during the last quarter of a century. The cumulative force of a number of increasingly effective influences has brought about a change of attitude now marked by a greater responsiveness to life needs than ever before in the history of great school systems. The school has felt pressure from two distinct sources, the industrial and the pedagogic. In addition to the growing demand for greater degrees of skill and efficiency in the industrial worker, the school has been affected by the realism, naturalism, and general pragmatism which have been developing since the Renaissance. Through these forces can be seen a progressively broadening tendency to bring the work of the school into a more vital relationship with the immediate world in which the child lives. However, but a good beginning has really been made. In all countries, supplementary schools only remotely connected with the regular systems of general education have been developed as the immediate solution of the problem of

educating the industrial worker. In addition to the conservative attitude of school authorities are the difficulties of organization and administration necessary to meet the needs of vocational methods and practice. The effort to make these new provisions and adjustments for increasing practical efficiency and industrial intelligence without sacrificing the precious values in the culture and discipline of the traditional curriculum, is often abandoned as an impossible problem and the old regime goes on without even a compromise.

But among all of the western nations, beginnings have been made. The specific problem before us is to indicate modifications in the chief public school systems pointing toward the unification of liberal and industrial education. By public school systems are meant those school provisions made by public support for general education up to the time when higher education or specialized vocational training begins, schools of which our American elementary and secondary schools are types. No consideration will be given to schools in which pupils are segregated for the purpose of specialized training in industrial vocations. Continuation schools, trade schools, or supplementary schools of any other kind will not be included. To be sure, many of these latter schools are supported by public taxation, local or state, and many are under the administration of the general school authorities; but they are schools in addition to schools maintained in the same communities for general education.

Having seen the practice and noted the tendencies in a number of typical systems, constructive suggestions will then be offered pointing to further development in the democratization of public school systems.

## Germany

In the development of supplementary schools for industrial and commercial arts, Germany has made marked progress within recent years. But in her schools for general education, both elementary and secondary, the conditions are much less hopeful. In country and village schools, gardening and agriculture have found a place of importance. In these schools, and also in many of the city schools, the gymnasia and real schools, several forms of handwork are found in grades corresponding to those

of our elementary schools. Up to the age of nine, simple work in clay, paper, cardboard, and natural and split wood is provided. More complex work in cardboard and rough wood construction follows up to the age of twelve. From twelve to fourteen, provision is often made for woodwork of a more refined character, occasionally some metal work, and here and there bookbinding and glass blowing. Work in glass blowing is usually confined to the making of simple apparatus for use in nature study or science work. In these upper grades the work indicated is for boys. In girls' schools there are often well planned courses in needlework. There are occasional schools in which both boys and girls are found, but they are in separate classes. The last years' courses often take on a distinctively practical character. In these years the work is differentiated on the basis of sex, both in kind and amount. In one of the people's schools of Munich, boys are held for more hours a week than girls, and girls are not required to take the same kind or amount of work in mathematics. The work of the last year is more than half devoted to practical ends, to a study of the principles and practice of probable vocational activities. Drawing and science studies receive much emphasis as vital to craftsmanship, although there is often much work in following exercises without variation, the pupil having little opportunity to design for himself the model he makes. In most schools, the drawing, as a subject, has a strong industrial bearing. The unification of the work in drawing and construction becomes quite complete in the continuation schools.

In connection with a number of schools, principally those of an elementary grade, are shops for work in wood and metals. However, there is little organic relation between the shop work and the regular school work in the elementary schools The shop work is elective and is taken outside of school hours. Practically no attempt is made to use the industrial arts as a means of direct education. The subject is not yet treated with the same consideration as other branches of instruction. But attempts in the direction of changing these conditions are not wanting. At Leipzic and Jena, summer courses are offered for training teachers in educational handwork. In the Leipzic workshop, special methods are worked out under the direction

of Dr. Goetze, and these are published in yearly courses. An attempt is made to work out courses in organic relation to the school curriculum. Teachers in regular school work may teach industrial arts in some cities if they take one or more holiday courses at Leipzic or elsewhere in special preparation. In some schools the shop work is taught by regular craftsmen who come to the school for this work alone.

As indicated in the foregoing, drawing and nature study have a place in all of the German elementary schools, and both subjects have a strong industrial bearing. In the changes for the secondary schools for boys in Prussia in 1901, certain modifications were made in the direction of greater emphasis upon industrial and commercial life, thus indicating a response of the school system in the secondary field also. In the study of foreign languages, it was pointed out that the languages be used more largely than formerly to introduce the student to a knowledge of the customs and culture of foreign peoples. In the selections for reading in the mother tongue, it was urged that more attention be given to geographic materials and that in the study of geography, more emphasis should be placed upon physical, industrial, and commercial phases. It was insisted further that a closer correlation between mathematics and physics should be made. While none of these changes provide direct industrial instruction, they all afford a means for the development of greater industrial interest and insight.

The kind of manual instruction developed in Germany thus far has not commended itself sufficiently to the government to secure adequate support for its introduction into the general schools as a required subject. Although wherever offered the industrial arts subjects are elective and usually free, the proportion of eligible boys taking them in many cities is but from five to ten per cent. In a very few schools the percentage runs up to nearly fifty, but this is exceptional. On the other hand, the success of the numerous continuation, trade, and other supplementary schools in meeting the need for immediately increased technical skill and efficiency has secured the most favorable state support for both financial aid and compulsory attendance laws. Continuation school attendance is compulsory up to sixteen years of age in twelve of the German states by state law; in nine

states it is compulsory in all of the towns or districts where it is imposed by local law, and in but the remaining four states is it voluntary.

It is thus seen that relatively little modification in general school practice has been made in Germany in response to industrial demands. Traditional influences of the father's vocation, limited financial outlook, small tendency to migration, and the limitations imposed by social distinctions all tend to fix the child's vocational choice at a relatively early age, without much attention to inclination or vocational guidance.

In the third report of the Royal Prussian State Industrial Office, 1909, it is stated that "the peculiarity of our system of secondary technical schools and of the elementary industrial continuation schools is found in that their aim is to make the matter of instruction immediately applicable to industrial life. This is the essential difference between them and the schools belonging to the ministry of worship and education." In Germany, France, Italy and Holland, the two systems, that of general education, and that of industrial education, are distinct. It is recognized however, that the industrial phases of education are built upon the foundation laid by the general system of schools. The present progress evidenced by the hold industrial arts work already begun is having upon those urging it most successfully, points to further modification of the general system of schools in the direction of a better foundation.

## France

France has enacted full legislative provision for the introduction of industrial arts into the regular school system. Industrial work is given in every elementary school. In country and small village schools, the emphasis is upon agricultural subjects; in other schools, upon manual arts and industries. Although manual work has been compulsory in all elementary schools since 1882, it varies greatly in character and effectiveness. In the larger cities workshops are usually provided for upper grade pupils. For France as a whole, however, the work is more often done in the regular class room. In most schools some work is given in concrete geometry in connection with the arithmetic, the emphasis being upon relationships to problems of construc-

tion. In the lower grades are found clay work, paper folding, and cardboard construction. In the upper grades, boys have work in wood and occasionally in metals. The girls have sewing, lace making, millinery, garment making, cookery, and sometimes silk culture.

In Paris the work in industrial arts is much above the average of that for France generally. There are nearly two hundred wood-working shops in Paris and about one third as many shops for metal working. The theoretical work in the schools of Paris is taught by regular teachers authorized to give it by passing an examination in manual training and drawing. But the actual manipulation of tools and materials is taught by craftsmen who go from school to school. They are required to pass an examination in geometry, drawing and woodwork. Geometric and mechanical drawing are a very fundamental part of the work in industrial arts as taught in the schools of Paris. Exercise pieces, sets of prescribed models, constitute the largest part of the work in the plan. This logical-sequence approach, the selection of models for the sake of teaching a sequence of tool processes and manual skills, largely controls the materials and methods of work beyond the primary grades throughout France. The study of projects typically illustrating industrial processes and methods, and of the industries themselves, finds little place in the work. It would seem that the possibilities for making the industrial arts really significant as preparatory to industrial vocations has not yet been appreciated for the elementary schools. Certain of the educational values of such work from the cultural standpoint have been felt, however, and the state has recognized these by making it compulsory. Beyond the age of thirteen, school attendance is optional in France.

In 1880 a law was enacted " for grafting technical instruction upon existing primary schools." The existing manual apprentice schools, and advanced primary or " professional " schools were coördinated with the elementary schools. Children graduating from the elementary schools at thirteen were admitted to these schools for a three year course. Nothing like apprenticeship to any particular trade was attempted. The aim was to give general industrial instruction and develop manual dexterity. Workshops were provided, and from five and a half to seven and

a half hours a day were spent in manual instruction of an industrial character. The school day was from seven forty-five in the morning until six in the evening, with a noon and mid-afternoon intermission. Excursions formed an important part of the work. Beside the drawing, geometry, mechanics, and industrial economy taught in direct relationship to vocational needs, there were given also French, history, geography, biology, physics, chemistry, arithmetic, accounts, and hygiene. For girls the academic work was the same, but the practical work was made up of domestic economy, sewing, cutting, and fitting. From 1880 until 1892, these schools were under the authority of the department of education. In 1892 all advanced elementary schools, industrial or commercial in character, were placed under the authority of the minister of commerce and industry, and were designated as "practical schools of commerce and industry." By 1900 the number of these schools and of other schools for trade and technical education operated under the auspices of the state board reached nearly three hundred. The system for trade and technical education is remarkably thorough, but the segregation of this form of work from the field of general education has been quite complete above the elementary school since 1892.

In both France and Germany, therefore, there seems to prevail a theory that liberal education and technical education are more adequately developed in separate institutions after the minimum foundation of the elementary school is secured.

### England

Although England has given state aid for diffusing a knowledge of the mechanic arts and the principles of design since 1837, and had encouraged such instruction in mechanics' institutes even as early as 1815, her first attempt to provide a means for so doing through the regular school system was not until about 1860. In 1857 the education department was reorganized and made to include the science and art department. From 1861, government grants were made for work in both science and art in some of the grammar schools in which it was found readily applicable where the modern side of education was developing. Under the act of 1870, the work in science and art was intro-

duced into the upper grades of the day schools. In 1872, special programs were promulgated giving definite plans for this work in the schools. By the act of 1890, the County Councils were given local authority to aid the work in science and art by grants derived from local revenues, and this aid could be given in both elementary and secondary schools. As reported by the Royal Commission of 1895, "County Councils have generally found it unwise, if not impossible, in dealing with children of school age, to treat technical instruction as a thing separate from general secondary education." Although it is not quite exact to speak of England's "system" of schools prior to 1902, it is fair to say that the schools providing for the general education of children of elementary and secondary rank had often received, where disposed to utilize it, rather generous aid in the introduction and development of industrial arts subject matter. The distinctively industrial bearing of the drawing and of the science work, wherever introduced, seems to justify rating these subjects as industrial. The impetus given to industrial drawing, industrial design, and industrial physics and chemistry as these subjects were directed, by the science and art division of the Education Department in the 70's, 80's, and 90's, has meant much to England in her development of manufacturing industries through this last quarter of a century.

Although great numbers of her boys left school at twelve or thirteen years of age to enter the ranks of the industrial worker, many had a foundation or an interest developed in the science and art work which brought them immediately into the evening schools or into the numerous supplementary day schools for continuing the work in science and industrial design. Outside of the schools for general education, the development of opportunities for the artisan class of working boys and men to continue their education by schools and extension classes has been really remarkable.

During the twenty years since 1890 the "manual training movement" has made itself markedly felt in England. The infant schools had developed simpler forms of handwork through the influence of the kindergarten idea. Woodwork for boys, and knitting and sewing for girls, made their way slowly into the upper grades. Since the education act of 1902, the develop-

ment toward a system providing instruction adapted to the needs of all children has given to industrial arts work in many schools a place almost as important as that of any other school subject. In most of the English cities handicraft work for boys, and domestic economy for girls are found with well equipped shops and laboratories. Although there is great variety in details of curriculum and method, most of the schools are developing the work from the industrial standpoint. Its purpose is avowedly vocational, yet there is increasing attention to the educational or liberal elements involved. In London, "centres" are established in connection with one school and the pupils of that school and neighboring schools are given instruction in that centre. These centres are well equipped. By 1909, accommodations had been provided for over 80 per cent of all of the children. All boys in Grade VI who are eleven years of age or more may take the handicraft work as may all boys also who are over twelve but below Grade VI. Most of the centres for handicraft give woodwork and this is suitably combined with drawing. Metal work is given in a few centres. For girls, centres are provided for domestic economy. Three divisions of this work are offered, cookery, laundry work, and housewifery. Girls of Grade V, and girls of twelve years of age below Grade V, are eligible to receive instruction in domestic economy. The work varies with the need of the particular districts in which the centres are located. Practical utility for the girls in their homes is a dominant factor in shaping the courses. A full half day is usually given to the work each week for both boys and girls, the teacher thus having two groups each day. In a few cities in England, periods are so shortened as to permit of three groups each day. In almost every school a series of models is found which usually combines the logical sequence idea with the industrial, that is, projects of appreciable utility are chosen and are so arranged that they provide the sequence for the development of tool processes and technical progress. In a few cities, the Sloyd system is found almost wholly unmodified. Most courses are planned to cover two or three years.

Below the grades doing work in centres or shops, there is often a well developed course in handwork. Paper folding, card-board construction, wire-work, cord-work, and parcel-tying

are often found. Clay modelling is occasionally employed. Knitting and needlework are very common in the lower grades.

The higher elementary schools take children at about eleven and one half years, giving them a course of three or four years. These schools make their curricula to fit the needs of particular localities. Some are distinctively industrial in their bearings, giving work as in the centers for industrial arts but devoting more time to the shops or laboratories, and making the mathematics, English, and drawing as definitely practical as possible. Others of these schools emphasize the commercial subjects, while still others are general in their nature.

Practically nothing has existed in England which could be regarded as a system of secondary education under state control. It is therefore almost impossible to say anything in general of work in industrial arts in secondary schools. The great "public" schools, Eaton, Rugby, and others, have very largely retained their distinctly classical character. St. Albans is a notable exception in its giving much attention to science, practical mathematics, and industrial arts. Through government grants from about 1881, aid was given to local initiative in the organization of science schools of secondary rank. In 1889 authority was given to the County Councils to aid schools of whatever kind in furthering technical education by local taxation, and, in 1890, local rates were largely relieved by a substantial annual grant from Parliament. Through this aid and influence the secondary schools willing to develop the "modern side" have introduced strong courses in science, drawing, and shop work. Many schools of a distinctively industrial type, as the Central School of Arts and Crafts, London, have been developed in recent years. These are maintained or aided by public funds. But they are distinctively separate from the plan of general education in their aim. They are to be classed in purpose and general character with the numerous and effective technical and evening schools for the further education of those who have left the regular schools and, in most cases, who have already entered the ranks of industrial workers.

Although system has been wanting in the whole field of secondary education in England and has but slowly developed in

elementary education, the general interest in industrial education has been so great that very material results are now evident in the character of the work accomplished in the schools maintained for general education. In Leeds, all pupils in the city elementary schools receive instruction in some form of handicraft. Quite in opposition to the general theory on the continent, English educators have felt that it was undesirable and unwise "to treat industrial education as a thing separate from general education." The theory that a trade cannot be taught in a school and that it can also not be taught without a school, has seemed to result in a wise unification of technical elements and cultural elements in the evolution of a satisfactory form of general and vocational education for the industrial workers.

### United States

From the influence of the exhibit of the Russian system of manual or technical instruction at the Centennial Exposition at Philadelphia in 1876, and the establishment of the Washington University Manual Training School at St. Louis in 1880, there has been an increasing interest in the industrial arts as a part of our American plan of general education. The work was usually introduced in the earlier years of this movement through the curricula of the high schools. By 1910 more than half of the 1,384 cities of the United States, each with a population of 4,000 or more, had manual training as a school subject. Separate buildings and courses forming manual training high schools have developed in some cases, while in others, departments or courses in the regular high schools have been added. The work soon found its way into the elementary schools. It was urged here both from above and below. The kindergarten influence with its emphasis upon the educational values of occupations and hand work extended upward through the lower grades; the appreciation of educational values together with the practical bearing of the work for children of beginning adolescence brought the subject downward from the high schools to the upper grades. Courses in domestic science and domestic art for girls are quite as common as manual arts for boys. The term industrial arts as here used for United States usually stands for the work of both boys and girls. Taking the public

schools as a whole, more than half of all of them in this country have industrial arts in several years of their courses of study. While the work has been introduced largely on the basis of educational or liberal values, in 1910 there were twenty-eight schools offering instruction with a vocational aim in their secondary departments. Types of these schools are represented by the Stuyvesant High School of New York City, the Fitchburg (Massachusetts) High School, the Technical High School of Cleveland, Ohio, and the Manual Training High School of Indianapolis, Indiana.

Legislation providing for or permitting the teaching of industrial arts subjects varies widely in the several states. States specifically providing for manual training as a part of the regular instruction in public schools are Arizona, California, Connecticut, Florida, Maine, Massachusetts, Nebraska, New Jersey, Ohio, South Carolina, Tennessee, Texas, Vermont and Virginia, fourteen in number. Thirteen require drawing, fourteen domestic science, and five commercial subjects. Legislation relative to courses of study is such in most states that it is permissive to introduce any of these subjects at the will of boards of education. Authorization for the industrial arts subjects is conditional in some states, as in Illinois, where, by a law of 1909, a referendum for the establishment of manual training departments in township high schools is provided, or as in Indiana where the work is authorized in cities of from 50,00 to 100,000 population, and in Kansas, providing manual training high schools or departments in cities of the first class and giving boards of education authority to levy a one half mill tax for their local support. Special schools under the control of public education authorities for all kinds of industrial arts and agricultural schools of secondary grade are coming to be authorized in a number of states. In most of these, state aid is added to local support. County schools of agriculture, schools of industrial arts or trades, and departments of industrial arts in upper grades and high schools are all types of opportunity created or authorized by numerous state legislatures. Although supported by local taxation and often supplemented by liberal state aid, these schools are usually relatively independent of the regular public schools save in general administration. They cannot be regarded

in very many instances as a modification of the regular school plan to meet the new industrial need. They too often mean the segregation of boys and girls who are not attracted strongly to the academic subjects as usually presented and who are often looked upon as inferior in intelligence. This cleavage of the school into classes is often accentuated by the teachers' sending the most undesirable of the pupils to the industrial school to be rid of them. That this cleavage should be avoided is one of the significant reasons for such a reorganization of the regular school work that the needs of these motor-minded and thing-thinker types of children may continue to derive their best development from some phases of work in common with those more given to idea thinking.

On the whole, in the United States, it would appear that legislation has been quite largely permissive rather than mandatory with respect to the industrial arts subjects, leaving definite action chiefly to local initiative.

Indirectly the schools have aided in their general work in meeting some needs of the industrial worker by the introduction of courses in nature study and in drawing. However, until recently, these subjects were so remote in their content from the real problems of life, that they had very little bearing upon the industrial studies. The work in high-school science, mathematics, and drawing has also been taught in a manner so purely academic that they have contributed but little to the enrichment of industrial studies.

Until recently the vocational aim has not much influenced the work in the schools for general education. The particular kind of industrial arts work offered in individual schools has varied with the particular viewpoint emphasized, although there has been a rather strong tendency toward unity through the selection of the most desirable elements in each type of interest. In the actual development of courses of work in many schools there has been but little consciousness of classification or system. The search for materials which would lend themselves to school-room manipulation has been wide and thorough. Paper, cardboard, clay, raffia, native grasses, barks, splints, cords, textile fibres and fabrics, leather, wood, metals, and almost every other material which would yield to the constructive efforts of teachers and

children have been utilized. Although educational values have often had little consideration in the selection of materials, four types of approach are evident as determining the greater proportion of the materials and projects selected for the elementary school. These are the neighborhood approach, the evolutionary, the "psychological" or "pedagogical," so called, and the industrial. These are by no means mutually exclusive but overlap more or less, each with the others. The kindergarten type of work, often extended into the first two or three grades of the elementary school, combines elements of the neighborhood and "pedagogical" approaches. Activities of the home and community with miniature imitations of the occupational materials and products are reproduced in paper, cardboard, clay, and other easily manipulated materials; sequences of work are planned which take account of the psychological development of the child, providing for training in sense perception, accuracy, skill, and the growth of interest, intelligence, and judgment in occupational activities going on about him. The evolutionary approach rests on the belief that there is desirable a study of the activities and occupations of peoples who have begun with a very simple mode of life, and follow with some haste the changes due to progress in man's conquest over the forces and materials of nature. Much of the work in construction in lower grades consists in making the homes, utensils, costumes, and implements of primitive peoples, gradually recapitulating the industrial problems of the race.

The "pedagogical" method utilizes models carefully selected in such a series as to develop a mastery of tool processes, knowledge of materials used, increased skill, and general technical excellence in execution. This series of models may be either of practice pieces of no utilitarian significance—mere exercises in processes—or it may be made up of utilitarian projects involving these elements of construction. This work is usually found in upper grades or high school only and is most typically represented by the Sloyd system or a modified Sloyd system. In the main, the use of models of practical character is employed, although the exercises in abstract processes are still to be found in some schools. The modified Sloyd systems have some elements of the "neighborhood" approach as the projects are usually selected, where possible, with reference to the products

used or produced in the particular community. The industrial approach emphasizes the industrial needs and activities of the present day, and especially of the child's own community. It endeavors to select projects which open up the fields of large industrial import, leading the child to a knowledge of these in their significant relationship to him. He must use products in wood, textiles, food materials, clay, and metals and he cannot do this intelligently and appreciatively without comprehensive knowledge of the methods and processes used in their making, the sources of their materials, and the means of their distribution. A rich body of thought lies vitally involved in this form of approach. Projects are largely for the purpose of clarifying ideas of construction and for serving as points of departure for related interests and problems. But these projects may be selected in such sequence as to provide for the development of technical ability as does the Sloyd system, to secure that vital interest in the immediate environment provided by the neighborhood approach, and, through a study of the evolution of each particular industry, to gain the perspective and understanding of the present furnished by the evolutionary approach. Further than these, the knowledge, the mastery of technique, and the interests developed, are all of rather direct vocational value for those whom choice or circumstance places in industrial vocations.

## Constructive Suggestions

The industrial viewpoint, developed within the last decade, is still in a very formative stage. It is illustrated as a dominant method of approach in but few schools. It does not apply very fully to the work of the primary grades. In these grades the work has been, is, and will probably continue to be dominated largely by a combination of the neighborhood and evolutionary forms of approach with such consideration for sequence as will meet the needs for the development of growing physical and mental powers of manipulation.

This primary period is not the time for emphasis upon accuracy, precision, or technical excellence of a high order in any phase of constructive work. In so far as these elements are attained, they should be largely as by-products of work whose intrinsic aim is the expression of ideas in industrial materials.

Degrees of excellence in finished products are to be measured in terms of the child's own best efforts without much repetition, rather than in terms of adult excellence. For the grades above the third, the industrial motive may receive increasing emphasis. Mastery of materials becomes sufficient to enable problems in construction to be solved as they are solved in the industries studied. Processes may be typically illustrative of those actually used in the industries. Studies in the historical phases of the industries may become studies in the evolution of industrial processes and problems and become valuable in interpreting and understanding the highly complex character of present day industrial life. Wherever the industrial motive is dominant in the selection of projects in the middle and upper grades, the correlated elements of history, geography, drawing, design, and mathematics appear to open up lines of investigation into the commercial manufacture of the products of which they are type illustrations. The forms of machinery which have been invented and are used, the types of power used, factors determining the location of power plants, the needs for organization of numerous aspects or parts of the industry into a system, the sources of materials and the distribution of products, the social life of the industrial workers—all of these, and some other related interests make up a portion of the work. Industrial intelligence, insight, and appreciation are all quite as important as technical excellence in execution. There is a growing feeling that all children, regardless of future vocations, should have such experience in the industrial work as will enable them to be intelligent and appreciative in their life contacts with industrial products and situations. All use the products of the industries—clothing, furniture, foods, vehicles, utensils, dwellings, and other essentials of material life. For the great majority this knowledge providing intelligence and appreciation in selecting products, for the use of economy in their purchase, use, and care, and for understanding the industrial problems of our times in their larger social aspects are of greater worth than the mere skill which may be developed in making any of the products. Relatively few of our people are employed in making furniture, but all use it. Cultivated taste in selecting furniture, good judgment in determining its worth, and usage which conserves its beauty and

utility are important for all. For developing this intelligence and appreciation, the elementary school, the school whose work is common to all without reference to sex or vocation, should certainly provide.

For the differentiation which is imposed by both the development of special inclinations and aptitudes in children on the one hand, and the call of vocations on the other, the secondary school should provide further development for the prospective machinist or cabinet-maker or printer, as much as for the prospective doctor or lawyer or minister. That this period for differentiation begins at approximately the close of the sixth school year rather than at the close of the eighth, seems to be supported by both psychological and social evidence. The tendency to reshape the school program to meet this condition is evidenced by the common introduction of industrial arts work of a secondary type at the beginning of the seventh school year, by the contemplated development of a six year secondary school course in a number of communities, and by the development of the three year intermediate school followed by a three year secondary course in some other cities or sections. In many cities the work in "manual training" of secondary character has been found unsatisfactory. It has been found too empty of thought content, of a body of organized ideas, to justify it fully as a cultural subject, and too inadequate in possibility for developing skill and trade efficiency to make it of much vocational worth. Segregating those selecting the work or pressing into it children of relatively poor ability for other school subjects, has often stigmatized the work as being for a class either lower in the social scale, or inferior in intelligence. Other subjects vitally important have failed to provide connections and relationships, and the work has stood more or less isolated from other school work on the one hand, and from industrial life in the real world on the other. This very isolation has tended toward the development of the types of schools which have grown up independently of the regular school system, the continuation schools, vocational schools, and trade schools. That the general school system can solve the secondary phase of this problem is in part evidenced by the fact that the twenty-eight cities referred to in the foregoing have accomplished much

towards a solution. That more can and of right ought to be accomplished through the regular school system we believe to be possible when a more satisfactory organization of the work is developed. To make this better organization is one of the large problems of our decade. We cannot graft upon our American system unmodified any plan as developed in any European country and hope to find it wholly satisfactory. Our ideals, our social conditions, and our industrial situations are fundamentally different in many respects essential to the problem.

To accomplish this needed reorganization, certain fundamental factors will have to be incorporated. Among these are an increased amount of time for practical work in shops and laboratories, possibly necessitating the lengthening of the school day; an almost complete change of attitude in the teaching of drawing, bringing out those phases and elements vital in design and draughtsmanship; a selection and organization of the principles and applications of physics and chemistry on the basis of their value and significance for industrial constructions and processes; a similar reorganization of mathematics of secondary grade; a selection of elements in physical, industrial, and commercial geography more vitally related to the sources, manufacture, and distribution of materials and products; and a new evaluation of history materials in their bearing upon industrial evolution. A curriculum constructed out of these reorganized subjects, and providing time and opportunity for shop work of a type which would constantly make application of principles developed in design, drawing, mathematics, and physics, would combine cultural elements and vocational elements, making for more efficient citizenship in all its phases. With the work that should be taken in common with those secondary pupils electing the industrial arts course and those in other courses, the social unity of the school would be preserved. Most of the foregoing subjects, if reorganized on the basis proposed, would be found so fundamentally sound as pertaining to affairs and to life in our day that they would commend themselves for their pragmatic worth to many students regardless of their anticipated vocations.

One of the largest general problems of the school is to be more helpful in giving boys and girls opportunities to find themselves. In view of the changes and the growing ideal interests

of children of the early adolescent period, it seems inexcusably wasteful to society so to neglect the question of vocational guidance. Even for those who can and do go through the four years of the usual high school there is rarely any real opportunity offered for the discovering of one's vocational aptitudes. The London, England, plan of scholarships for promising upper grade pupils, enabling them further to develop talent and capacity discovered by teachers and school inspectors, is full of suggestiveness for American schools.

The social side, the really human side, of the education of the industrial worker has been almost wholly neglected. In a small number of schools, beginnings have been made. The hours of labor, the amount of child labor, the wages, the standards of living, the amusements and opportunities for education, the status as to trade unions or fraternal organizations, the protection of life and limb by employers' liability laws—these and other questions that are of much social interest and significance receive attention in but few schools. That a knowledge of these facts and relationships is important to the child in his selection of a vocation is certainly true, and it is just as true that this knowledge is of value in its bearing upon that society in which the industrial worker is to share the privilege of making the laws of the land and of sharing its corporate life.

That expediency demands the erection of means for educating further those who have dropped out of school and are now at work in the industries is coming to be generally accepted. But to leave the solution of the problem to schools supplementary to the trades and vocations, and wholly independent of the general school administration, would seem to be in violation of the nature of a system of democratic education. The only solution consistent with our general theory of democratic education is the development of such elementary and secondary schools as will provide, under the general system, that equality of opportunity for all which will enable them to live more efficiently in their vocations as well as out of them whenever circumstances require that the vocation must be entered upon.

# THE COST OF INDUSTRIAL EDUCATION IN THE UNITED STATES: A STUDY OF FIFTY TYPICAL SCHOOLS

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At the present time when so much attention is being directed toward the subject of industrial education, teachers and others interested in this new line of work are seeking information concerning the organization and cost of industrial schools already in operation.

In order to secure as much as possible of this information, a study has been made covering four rather distinct purposes, namely: (1) To secure data on the cost and organization of industrial schools and to arrange them in convenient form for reference; (2) to make a comparison of the cost of industrial schools with that of the common schools as found by Professor George D. Strayer in "City School Expenditures"; (3) to make a comparative study of the individual schools of the various types; and (4) to suggest means by which a more helpful report may be made.

The first attempt to secure such material was made by examining city school reports, census reports, catalogues and circulars from the various industrial schools.

In general, data furnished by the city school reports were disappointing. The courses of study usually were given, but items of expenditure were grouped in such a way that it was impossible to differentiate the expenditures of the various items. For example, in some cases the item of salaries included teaching, supervision and janitors' salaries. In other cases janitors' service was found under the item of maintenance. The census reports, while containing more or less complete statements of the larger items of expenditure, were not available later than 1909, and the items were not grouped under headings that

admitted of comparison with Professor Strayer's report. The catalogues and circulars failed to state the expenditures in any form that would admit of comparison among themselves.

A questionnaire was sent to each of the several industrial schools to secure first hand data of expenditures and organization that would be in tangible form and which would admit of comparison with the report of Professor Strayer.

Of the one hundred letters sent out, answers were received from seventy-five schools, twenty-five of which were so incomplete that the material could not be used. Some left the items of expenditure vacant, stating that their school was a part of the city school system and that the city's supplies were bought together for all schools and departments.

Other schools failed to include one or more items of expenditure and the report, therefore, had to be discarded. After considerable supplementary work fifty fairly complete reports were obtained, from Table I was made out.

In examining this table, there will be noted at once the diversity of the schools as to the number of pupils, number of courses, and cost of maintenance and equipment. Compare, for example, School No. 4 which has only 45 pupils and an original equipment of $17,000.00 with School No. 1 which has 3136 pupils and an equipment of $1,081,777.00. These schools differ so widely in organization and purpose that any comparison which might be made can be used only to show educational tendencies in a very general way. Among the factors that affect the cost is that of location. The cost of maintenance of a school in Boston would be quite different from that of a school in Indianapolis or Omaha. Some courses require an expensive laboratory equipment in which only 15 or 20 pupils can be accommodated while in lecture rooms as many as 40 or 50 pupils may be successfully handled. Again the cost of supplies and apparatus in some subjects, mathematics for example, will probably be nothing while in others like plumbing or steam-fitting it will be very high. Also the cost of maintenance of a building for a school of 400 pupils may be as great as that of a school two or three times as large. This may be seen in the case of some of the new schools where large and expensive buildings have been erected but where the courses have not yet filled up. In

## TABLE I

SUMMARY OF DATA FOR FIFTY INDUSTRIAL SCHOOLS

| Number of School | Students | | | Term in Months | Number of Courses | Salaries of Teachers and Supervisors | Repairs and Replacements of Equipment | New Equipment | Care of Building, Janitors' Salaries, Fuel, Water, etc. | Books, Supplies, Materials, etc. | Other Expenditures | Original Cost of Equipment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Total | | | | | | | | | |
| 1 | | | 3136 | 9 | 18 | $97,550 | $200 | $2,000 | $37,236 | $3,500 | $5,000 | $1,081,777 |
| 2 | 1450 | | 1450 | 10 | 6 | 76,000 | | | 9,500 | | 13,500 | |
| 3 | 235 | | 235 | 12 | 6 | 25,000 | | 4,000 | | 6,000 | | 550,000 |
| 4 | 300 | | 300 | 12 | | 14,747 | 320 | 20,692 | 1,486 | 3,002 | 5,347 | 48,000 |
| 5 | 202 | 812 | 1014 | | 7 | 122,000 | | 1,000 | | 505 | 2,029 | 10,000 |
| 6 | 310 | | 310 | 10 | 8 | 18,900 | | | 4,000 | 3,500 | | 182,000 |
| 7 | 45 | | 45 | 12 | 6 | 10,000 | | 17,000 | 5,500 | 500 | | 17,000 |
| 8 | | | 381 | 12 | 8 | 8,841 | | | 1,635 | 2,183 | 871 | 33,346 |
| 9 | 767 | 977 | 1744 | 10 | 13 | 45,900 | 250 | 7,281 | 4,243 | | | 63,550 |
| 10 | 263 | 465 | 728 | 9 | 13 | 45,900 | 2,500 | | 1,200 | | | 38,800 |
| 11 | 645 | 24 | 669 | 11 | 14 | 30,050 | | 11,692 | 22,096 | 9,404 | | 556,452 |
| 12 | 199 | 110 | 229 | 12 | 6 | 34,648 | 4,831 | | | 1,052 | 33,537 | |
| 13 | 250 | | 250 | 10 | 10 | 26,017 | | | 9,371 | 3,424 | 17,661 | |
| 14 | 800 | | 800 | 10 | 11 | 18,000 | 150 | 500 | | 2,350 | | 90,000 |
| 15 | 688 | | 688 | 12 | 18 | 12,826 | | | 5,796 | 1,053 | | 50,000 |
| 16 | | 400 | 400 | 12 | 8 | 29,000 | | | 4,500 | 1,000 | | 29,000 |
| 17 | 144 | 460 | 604 | 8 | 5 | 12,000 | | | 300 | 150 | | 12,000 |
| 18 | | 405 | 405 | 12 | 6 | 8,286 | 1,282 | | 1,410 | 1,125 | 540 | 7,000 |
| 19 | 120 | | 120 | 12 | 6 | 7,500 | | 800 | 1,500 | 500 | | 5,800 |
| 20 | 1500 | 1572 | 3072 | 10 | 6 | 240,000 | 2,700 | 1,506 | 16,328 | 12,000 | | 934,776 |
| 21 | 320 | 4 | 324 | 12 | 3 | 12,000 | 1,000 | | 1,800 | | 5,000 | 90,000 |
| 22 | 14 | 391 | 405 | 9 | 5 | 4,100 | | | | | | 2,312 |
| 23 | 636 | 561 | 1197 | 9 | | 51,000 | 500 | 2,840 | 8,641 | 2,500 | 101 | 24,000 |
| 24 | 1073 | 892 | 1965 | 10 | 7 | 120,000 | 43,000 | 15,000 | | | | 43,000 |
| 25 | 2043 | 989 | 3032 | 9 | | 100,000 | | | 25,000 | 6,000 | | 2,000,000 |

TABLE I—(*Continued*)

SUMMARY OF DATA FOR FIFTY INDUSTRIAL SCHOOLS

| Number of School | Students | | | Term in Months | Number of Courses | Salaries of Teachers and Supervisors | Repairs and Replacements of Equipment | New Equipment | Care of Building, Janitors' Salaries, Fuel, Water, etc. | Books, Supplies, Materials, etc. | Other Expenditures | Original Cost of Equipment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Total | | | | | | | | | |
| 26 | 1010 | | 1010 | 9 | 5 | $25,000 | $10,000 | $11,000 | $4,500 | $1,500 | $500 | $56,000 |
| 27 | | 2470 | 2470 | 8 | 16 | 22,263 | 1,480 | | 2,126 | 1,151 | | 1,322 |
| 28 | 51 | | 51 | 12 | 6 | 5,480 | | 1,275 | 490 | 300 | 305 | |
| 29 | 120 | 33 | 153 | 10 | 14 | 12,900 | | 2,500 | 2,500 | | | 25,000 |
| 30 | 70 | 35 | 105 | 9 | | 7,900 | 1,000 | | 650 | 1,700 | | 5,000 |
| 31 | 500 | | 500 | 12 | | 14,500 | 200 | 1,000 | 600 | | 2,500 | 10,000 |
| 32 | 160 | | 160 | 12 | 5 | 3,200 | | | | 1,200 | 200 | 5,000 |
| 33 | 285 | | 285 | 12 | 9 | 32,000 | 1,000 | | | 800 | | 80,000 |
| 34 | 1279 | | 1279 | 10 | 10 | 100,450 | 5,000 | 7,500 | 24,500 | 1,000 | | 50,000 |
| 35 | 124 | 170 | 294 | 9 | 11 | 4,765 | 2,000 | 16,000 | 500 | 275 | 350 | 6,940 |
| 36 | 2001 | 1778 | 3779 | 10 | 28 | 65,500 | 10,000 | | 9,500 | | | 150,000 |
| 37 | 1015 | 1775 | 2790 | 9 | 19 | 41,748 | 6,859 | 2,655 | 10,249 | 3,330 | 16,058 | 321,000 |
| 38 | 1711 | 900 | 2611 | 8 | 24 | 110,000 | 100,000 | 150,000 | 31,886 | 1,400 | 13,457 | 1,000,000 |
| 39 | 117 | 114 | 231 | 10 | 6 | 8,400 | 2,500 | | 1,500 | 1,226 | | 90,000 |
| 40 | 1100 | 450 | 1550 | 9 | 13 | 62,000 | 10,000 | 45,000 | 24,747 | 5,943 | 130,000 | 1,791,000 |
| 41 | 1144 | | 1144 | 12 | | 15,000 | 400 | 5,000 | 6,400 | 1,100 | 3,000 | 42,500 |
| 42 | 304 | 302 | 606 | 10 | 10 | 32,000 | 5,000 | 5,000 | 2,700 | 600 | | 60,000 |
| 43 | 425 | 125 | 450 | 6 | 10 | 4,018 | | 1,928 | 484 | 482 | 285 | 35,000 |
| 44 | 70 | | 70 | 12 | 4 | 5,900 | | 3,500 | | 1,000 | 600 | |
| 45 | 575 | 757 | 1332 | 9 | 11 | 16,950 | 309 | | 443 | | | 253,000 |
| 46 | 1019 | 651 | 1670 | 12 | 18 | 17,900 | 2,000 | 2,000 | 1,500 | 3,000 | 2,000 | 60,000 |
| 47 | 782 | 1000 | 1782 | 10 | 8 | 89,558 | 1,753 | 579 | 8,474 | 2,748 | 1,245 | 60,000 |
| 48 | 950 | | 950 | 10 | 7 | 74,910 | | | 12,300 | 6,000 | | 500,000 |
| 49 | 253 | 257 | 510 | 10 | 6 | 2,650 | 50 | | 500 | | | 12,000 |
| 50 | 523 | 356 | 779 | 9 | 13 | 95,747 | 1,977 | | 6,630 | | 1,086 | 226,000 |

NOTE: Items of expenditure will be found reduced to per cents of total expenditure in Table II.

TABLE II

COST PER PUPIL, AND PER CENT OF TOTAL COST OF EACH ITEM

| Number of School | Cost per Pupil per Month | Per Cent of Total Cost | | | | | Cost of Equipment per Pupil | Cost of New Equipment per Pupil |
|---|---|---|---|---|---|---|---|---|
| | | Teaching and Supervision | Repairs and Replacements | Care of Buildings, Janitors' Salaries, etc. | Books, Supplies, Materials, etc. | Other Expenditures | | |
| | | Per Cent | Per Cent | Per Cent | Per Cent | Per Cent | | |
| 1 | $5.34 | 67.0 | | 26.3 | 2.4 | 3.44 | $345.00 | $.61 |
| 2 | 6.41 | 76.7 | | 9.6 | | 13.7 | | |
| 3 | 10.97 | 80.6 | | | 19.3 | | 302.00 | |
| 4 | 8.91 | 59.2 | 1.3 | 5.9 | 12. | 21.4 | 160.00 | |
| 5 | 12.41 | 96.4 | | 1.6 | .3 | 1.6 | 9.60 | 1.06 |
| 6 | 8.11 | 71.2 | | 15.1 | 13.2 | | 2,585.00 | |
| 7 | 29.63 | 62.5 | | 34.4 | 3.1 | | 378.00 | |
| 8 | 3.10 | 65.3 | | 12. | 16.1 | 6.4 | 87.20 | |
| 9 | 5.36 | 94.4 | .2 | 4.5 | .5 | | 36.50 | .01 |
| 10 | 8.47 | 92.0 | 5.4 | 2.4 | | | 53.90 | 3.42 |
| 11 | 9.04 | 48.9 | | 35.9 | 15.2 | | 832.00 | |
| 12 | 26.95 | 46.7 | 6.5 | | 1.4 | 45.2 | | 21.20 |
| 13 | 22.50 | 45.7 | | 16.4 | 6.4 | 31.5 | | |
| 14 | 25.69 | 86. | 2.4 | | 11.2 | | 112.00 | .19 |
| 15 | 4.61 | 33. | | 14.6 | 28.7 | 23.7 | 72.90 | |
| 16 | 7.91 | 84.6 | | 13.4 | 2.8 | | 72.20 | |
| 17 | 2.59 | 96.4 | | 2.4 | 1.2 | | 20.00 | |
| 18 | 2.60 | 65.2 | 11.1 | 8.8 | 4.2 | 10.9 | 17.30 | 3.61 |
| 19 | 5.65 | 79. | | 16.8 | 5.3 | | 48.30 | |
| 20 | 8.82 | 88.5 | 9.9 | 6. | 4.4 | | 311.00 | .88 |
| 21 | 4.82 | 60.6 | 5.3 | 9.0 | | 25.3 | 278.00 | 3.18 |
| 22 | 1.06 | 100. | | | | | 5.72 | |
| 23 | 2.66 | 81.2 | .9 | 13.7 | 4.1 | .9 | 20.50 | .48 |
| 24 | 9.06 | 67.4 | 24.1 | 8.5 | | | 21.80 | 21.80 |
| 25 | 4.80 | 76.3 | | 19.1 | 4.5 | | 650.00 | |
| 26 | 4.56 | 60.2 | 24.0 | 10.8 | 3.6 | 1.2 | 54.90 | 9.85 |
| 27 | .39 | 82.4 | 5.1 | 7.8 | 4.2 | | .53 | .60 |
| 28 | 19.43 | 83. | | 7.4 | 4.5 | 4.8 | | |
| 29 | 10.64 | 92.3 | | 7.6 | | | 162.00 | |
| 30 | 9.28 | 70.2 | 8.8 | 5.7 | 15.1 | | 46.70 | 9.50 |
| 31 | 2.96 | 81.4 | 1.1 | 3.4 | | 14. | 20.00 | .40 |
| 32 | 2.34 | 69.6 | | | 26.3 | 4.3 | 31.20 | |
| 33 | 11.40 | 94.6 | 2.9 | | 2.3 | | 282.00 | 3.51 |
| 34 | 10.24 | 76.7 | 3.8 | 18.8 | | .7 | 39.30 | 3.93 |
| 35 | 25.30 | 60.4 | 25.3 | 6.3 | 3.4 | 4.4 | 23.70 | 6.82 |

TABLE II—(*Continued*)

COST PER PUPIL, AND PER CENT OF TOTAL COST OF EACH ITEM

| Number of School | Cost per Pupil per Month | Per Cent of Total Cost | | | | | Cost of Equipment per Pupil | Cost of New Equipment per Pupil |
|---|---|---|---|---|---|---|---|---|
| | | Teaching and Supervision | Repairs and Replacements | Care of Buildings, Janitors' Salaries, etc. | Books, Supplies, Materials, etc. | Other Expenditures | | |
| | | Per cent | Per cent | Per cent | Per cent | Per cent | | |
| 36 | $2.49 | 69.2 | 10.2 | 10.0 | | | $39.60 | $2.65 |
| 37 | 3.11 | 53.5 | 8.7 | 13.2 | 4.2 | 20.5 | 1,650.00 | |
| 38 | | 42. | 39. | 12.4 | .5 | 5.2 | 382.00 | 2.50 |
| 39 | 4.81 | 75.4 | | 13. | 11.1 | | 387.90 | 38.20 |
| 40 | 7.23 | 61.6 | 18.3 | 11. | 9. | | 1,126.00 | |
| 41 | 1.88 | 57.2 | 1.5 | 24.7 | 4.3 | 11.4 | 37.30 | 4.35 |
| 42 | 6.35 | 79.3 | 12.4 | 6.7 | | 1.4 | 95.50 | 8.30 |
| 43 | 2.48 | 59.8 | | 28.7 | 7.1 | 4.2 | 75.50 | 4.27 |
| 44 | 13.33 | 78.6 | | | 13.3 | 8. | | 50.00 |
| 45 | 1.40 | | | | | | | |
| 46 | 1.12 | 67.8 | 7.5 | 5.6 | 11.3 | 7.5 | 36.60 | 1.19 |
| 47 | 6.18 | 86.2 | 1.6 | 8.1 | 2.6 | 1.1 | 33.80 | .99 |
| 48 | | 80. | | 13.2 | 6.4 | | 52.80 | |
| 49 | 6.27 | 82.8 | | 15.6 | | | 21.70 | .09 |
| 50 | 3.63 | 61.9 | 7.7 | 26. | | 43. | 282.00 | 2.58 |

some cases where the work is given only at night instruction can probably be secured for less than in day work. Again in some schools pupils may be enrolled in a single class while in others three or four separate courses may be pursued.

In this report the following types of schools are represented:

1. *Manual Training Schools,* usually a part of the public school system and originally intended to contribute to vocational efficiency; now interpreted by educators to furnish a basis for a liberal education, making the pupil familiar with industrial processes and thereby affording an opportunity for an appreciation for and a sympathy with those engaged in industrial vocations.

2. *Technical High Schools,* originally organized to aid the pupil who wished to enter the higher ranks of shop and trade

TABLE

TABLE OF

Cost per pupil of equipment and maintenance, and per

| Cost per Pupil per Month | | Repairs and Replacements | | Other Expenditures | | New Equipment per Pupil | |
|---|---|---|---|---|---|---|---|
| Dollars | Frequency | Per Cent | Frequency | Per Cent | Frequency | Dollars | Frequency |
| Less than 1 | 1 | Less than 1 | 2 | Less than 1 | 2 | Less than 1 | 8 |
| 1 | 4 | 1 | 4 | 1 | 4 | 1 | 3 |
| 2 | 7 | 2 | 2 | 2 | 1 | 2 | 3 |
| 3 | 4 | 3 | 1 | 3 | | 3 | 5 |
| 4 | 5 | 4 | | 4 | 5 | 4 | 2 |
| 5 | 3 | 5 | 3 | 5 | 1 | 5 | |
| 6 | 5 | 6 | 1 | 6 | 1 | 6 | 1 |
| 7 | 2 | 7 | 2 | 7 | 1 | 7 | |
| 8 | 4 | 8 | 2 | 8 | 1 | 8 | 1 |
| 9 | 3 | 9 | 1 | 9 | | 9 | 2 |
| 10 | 3 | 10 | 1 | 10 | 1 | 10 | |
| 11 | 1 | 11 | 1 | 11 | 1 | — | |
| 12 | 1 | 12 | 1 | 12 | | 21 | 2 |
| — | | — | | 13 | 1 | — | |
| 19 | 1 | 18 | 1 | 14 | 1 | 38 | 1 |
| — | | — | | — | | — | |
| 22 | 1 | 24 | 2 | 20 | 1 | 50 | 1 |
| — | | 25 | 1 | 21 | 1 | | |
| 25 | 1 | — | | 22 | | | |
| — | | 39 | 1 | 23 | 1 | | |
| 29 | 1 | | | 24 | | | |
| | | | | 25 | 1 | | |
| | | | | — | | | |
| | | | | 31 | 1 | | |
| | | | | — | | | |
| | | | | 45 | 1 | | |
| Median | 4.8 | | 6.5 | | 5.5 | | 2.1 |
| 2Q | 6.1 | | 9.2 | | 14.0 | | 4.8 |
| Per Cent 2Q is of Median | 126.0 | | 142.0 | | 255.0 | | 230.0 |

III

FREQUENCIES

cent of total cost of the several items of expenditure

| Teaching and Supervision | | Care of Buildings, Water, Fuel, etc. | | Books, Supplies, Materials, etc. | | Original Cost of Equipment per Pupil | |
|---|---|---|---|---|---|---|---|
| Per Cent | Frequency | Per Cent | Frequency | Per Cent | Frequency | Dollars | Frequency |
| | | | | Less than 1 | 2 | Less than 10 | 3 |
| 33 | 1 | 1 | 1 | 1 | 2 | 10 | 1 |
| — | | 2 | 2 | 2 | 4 | 20 | 6 |
| 42 | 1 | 3 | 1 | 3 | 3 | 30 | 7 |
| — | | 4 | 1 | 4 | 8 | 40 | 2 |
| 45 | 1 | 5 | 3 | 5 | 1 | 50 | 3 |
| 46 | 1 | 6 | 3 | 6 | 2 | 60 | |
| 47 | | 7 | 3 | 7 | 1 | 70 | 3 |
| 48 | 1 | 8 | 3 | 8 | | 80 | 1 |
| — | | 9 | 2 | 9 | 1 | 90 | 1 |
| 53 | 1 | 10 | 2 | 10 | | 100 | |
| — | | 11 | 1 | 11 | 3 | 110 | 1 |
| 57 | 1 | 12 | 3 | 12 | 1 | — | |
| 58 | | 13 | 6 | 13 | 2 | 160 | 2 |
| 59 | 2 | 14 | 1 | 14 | | — | |
| 60 | 3 | 15 | 2 | 15 | 2 | 260 | 1 |
| 61 | 2 | 16 | 2 | 16 | 1 | 270 | 1 |
| 62 | 1 | 17 | | — | | 280 | 1 |
| — | | 18 | 1 | 19 | 1 | — | |
| 65 | 1 | 19 | 1 | — | | 310 | 2 |
| 66 | | — | | 26 | 1 | — | |
| 67 | 1 | 24 | 1 | 27 | | 340 | 1 |
| 68 | | 25 | | 28 | 1 | — | |
| 69 | 2 | 26 | 2 | | | 370 | 1 |
| 70 | 1 | 27 | | | | 380 | 2 |
| 71 | 1 | 28 | 1 | | | — | |
| — | | — | | | | 650 | 1 |
| 75 | 1 | 34 | 1 | | | — | |
| 76 | 1 | 35 | 1 | | | 830 | 1 |
| 77 | | | | | | — | |
| 78 | 1 | | | | | 1120 | 1 |
| 79 | 2 | | | | | — | |
| 80 | 2 | | | | | 1650 | 1 |
| 81 | 2 | | | | | — | |
| 82 | 1 | | | | | 2585 | 1 |
| 83 | 1 | | | | | | |
| — | | | | | | | |
| 86 | 2 | | | | | | |
| 87 | | | | | | | |
| 88 | 1 | | | | | | |
| — | | | | | | | |
| 92 | 2 | | | | | | |
| 93 | 2 | | | | | | |
| 94 | 2 | | | | | | |
| — | | | | | | | |
| 100 | 1 | | | | | | |
| Median | 73.0 | 11.5 | | 4.9 | | $60.00 | |
| 2Q | 21.7 | 8.0 | | 8.4 | | $259.80 | |
| Per cent 2Q is of Median | 30.0 | 70.0 | | 171.0 | | $433.00 | |

workers. They have gradually developed into preparatory schools for college engineering students.

3. *The Intermediate Industrial School,* in general a type of school designed to take the youth of thirteen or fourteen years of age when he leaves the common schools and teach him the elements of a trade and such supplementary work as is deemed necessary for pursuits in which a high grade of industrial intelligence rather than skill is desired.

4. *The Trade School,* intended to teach in a short time all the skill and knowledge necessary that the workman may enter into competition with workmen already in the trade.

5. *The Continuation School,* which has for its purpose the further development of the worker who is already actively engaged in an occupation. These are, at present, usually evening schools carried on in connection with manual training schools, technical high schools, and at institutions such as Pratt Institute and Cooper Union. In this type of school the emphasis is upon the work supplementary to the trade,—mathematics, physics, etc.,—as the student is usually actively engaged in some vocational pursuit.

Table II is given that we may make a comparison of the various items of expenditure with those found by Professor Strayer in "City School Expenditures" in which he made a study of 57 cities, the inhabitants of which ranged from twenty-five to fifty thousand and in which he determined what he considered the proper distribution of money among the different items of expenditure. This distribution is given in Table IV.

In Table II are given the cost per pupil per month, not taking account of deterioration or new equipment, and the various expenditures reduced to percentages of total cost. For example, School No. 12 pays $26.95 per pupil per month. It expends 46.7 per cent of its budget for teaching, 6.5 per cent for repairs, 1.4 per cent for books, supplies, and materials, and 45.2 per cent for other expenditures. The original cost of equipment per pupil is not known and it pays $21.20 per pupil for new equipment. It seems strange that School No. 22 spends 100 per cent for teaching and supervision. One must certainly conclude that the writer has failed to include the other items of expenditure in the report. Another surprising thing is that some schools

spend such a small amount per pupil while others are so extravagant. For example, School No. 27 spends only $0.39 per pupil per month while No. 12 spends $26.95 or nearly 60 times as much. However, from an educational standpoint the extreme cases are not so important as the general tendency of the group. This is ordinarily found by taking the average but since the average is affected largely by the extreme cases a much better measure of the tendency is the median, that measure above and below which an equal number of the cases lie.

To determine the medians Table III has been made out. It is made from Table II by expressing in terms of frequency in ascending series differences of one dollar. The table reads: In the case of the cost per pupil per month there was one school paying less than one dollar per pupil per month. There were four paying more than one dollar and less than two dollars, and so on. It will be noticed that there are more schools paying between two and three dollars per pupil per month than any other quantity. The median in the case of the cost per pupil per month is $4.80.

It will be noticed in Table IV that the proportions in the distribution of the different items of expenditure do not differ much from those found in the common schools, and that the cost per pupil per month is less than twice that of the common schools. It is evident that the item of repairs and replacements is higher in the industrial schools, a fact naturally to be expected.

TABLE IV

PERCENTAGES OF TOTAL COST IN INDUSTRIAL SCHOOLS COMPARED WITH THOSE FOUND BY PROFESSOR STRAYER IN THE PUBLIC SCHOOLS

| | Public Schools | Industrial Schools |
|---|---|---|
| | Per Cent | Per Cent |
| Teaching and Supervision | 70 to 75 | 73.0 |
| Care of Buildings, Janitors' Salaries, Fuel, Water, etc | 10 to 14 | 11.5 |
| Text-Books, Materials, Supplies, etc | 4 to 6 | 4.9 |
| Repairs and Replacements in Equipment | 3 to 5 | 6.5 |
| Other Expenditures | | 5.5 |
| Cost per Pupil per Month | $3.20[1] | $4.80[2] |

[1]Based on average daily attendance.
[2]Based on enrollment.

The fact that industrial schools vary so widely in organization and purpose would lead one to expect a wide variability in cost of equipment and maintenance. A study of Table III justifies this expectation.

TABLE V

A Comparison of the Variability of Industrial Schools and Common Schools, Using as a Coefficient of Variability the Per Cent Which 2Q is of the Median

| Per Cent of Total Expenditure Used For: | 2Q | Median | Per Cent which 2Q is of the Median |
|---|---|---|---|
| Industrial Schools | | | |
| Teaching and Supervision | 21.7 | 73.0 | 30 |
| Care of Buildings, Janitors' Salaries, Fuel, Water, etc | 8.0 | 11.5 | 70 |
| Text-Books, Materials, Supplies, etc. | 8.4 | 4.9 | 171 |
| Other Expenditures | 14.0 | 5.5 | 255 |
| Cost per Pupil per Month in Dollars | 6.1 | 4.8 | 126 |
| Common Schools[1] | | | |
| Teaching | 9.0 | 68.4 | 14 |
| Supervision | 8.0 | 8.0 | 100 |
| Janitors' Salaries | 4.0 | 7.6 | 65 |
| Fuel | 1.0 | 5.9 | 16 |
| Cost per Pupil per Month | 7.0 | 28.8 | 25 |

[1]Based on Professor Strayer's Report.

Frequencies for the various costs per pupil per month, of original equipment and new equipment, and of the percentages of the total amount used for the several items of maintenance have been arranged in order and the median values found. These median values are shown at the foot of the respective columns. The 2 Q value, that showing the limits within which the middle 50 per cent of the cases lie, is also given. By finding the per cents which 2 Q is of the median, we get a coefficient of variability giving a still better idea of the variability than the 2 Q alone. For convenience in making a rapid survey of this variability in summary and a comparison by industrial schools and public schools Table V has been derived from Table III. It will be noted that for most items the variability for industrial schools is greater than for the public schools.

The very high variability of the items, text-books, etc., other expenditures, and cost per pupil per month for industrial schools can be appreciated more fully in meaning by reference to these items in Table III. Here it will be seen that there is a "skew" distribution, the greatest number of frequencies being in the portions representing the lowest values. The same explanation also applies to the high variability coefficients for the original cost of equipment, the new equipment, and the repairs and replacements in Table III.

In the following tables an effort has been made to bring the schools of a particular type together for a comparison of the various items of cost. In many of the schools no definite classification can be made as the school is doing work along two or more of these vocational lines. For example, we find manual training schools, whose shops are used for night school work. In these there seems to be no differentiation of expenditures for the two lines of work. In classifying the writer has tried to place each where the greater part of the expenditure seems to be made.

Under the type of Manual Training Schools we have the following:

| Number of School | Cost Per Pupil Per Month | Per Cent for Teaching and Supervision | Equipment Per Pupil |
|---|---|---|---|
| 9 | $5.36 | 94.4 | $36.50 |
| 10 | 8.47 | 92.0 | 53.90 |
| 20 | 8.82 | 88.5 | 240.80 |
| 34 | 10.24 | 76.7 | 39.30 |
| 35 | 25.30 | 60.4 | 23.70 |
| 42 | 6.35 | 79.3 | 95.50 |
| 47 | 6.18 | 86.2 | 33.80 |
| 50 | 3.63 | 61.9 | 211.80 |

It will be noticed that the variation in the cost per pupil is not very great among these schools except in the case of School No. 35 which is an endowed school whose enrollment is not yet very large.

The following may be classified as Technical High Schools:

| Number of School | Cost Per Pupil Per Month | Per Cent for Teaching and Supervision | Equipment Per Pupil |
|---|---|---|---|
| 2 | $6.14 | 76.7 | $72.20 |
| 16 | 7.19 | 84.6 | 72.20 |
| 24 | 9.06 | 75.4 | 21.80 |
| 39 | 4.81 | 75.4 | 378.00 |
| 48 | | 80.0 | 52.80 |

Under the heading of Trade Schools have been included only day schools of more or less well recognized standing.

| Number of School | Cost Per Pupil Per Month | Per Cent for Teaching and Supervision | Equipment Per Pupil |
|---|---|---|---|
| 3 | $10.97 | 80.6 | $312.00 |
| 4 | 8.91 | 59.2 | 160.00 |
| 5 | 12.41 | 96.4 | 9.64 |
| 6 | 8.11 | 71.2 | 587.09 |
| 8 | 3.10 | 65.3 | 87.20 |
| 15 | 4.61 | 33.0 | 72.90 |
| 18 | 2.60 | 65.2 | 87.20 |
| 31 | 2.96 | 81.4 | 20.00 |

It will be noticed that the percentage devoted to instruction is lower in trade schools than in the schools shown above. This is probably due to the fact that materials for trade schools cost more than those for manual training or technical schools.

Among those schools that offer instruction to the workman already in the trade (Higher Trade Schools) the following seem to be the more important:

| Number of School | Cost Per Pupil Per Month | Per Cent for Teaching and Supervision | Equipment Per Pupil |
|---|---|---|---|
| 1 | $5.34 | 67.0 | $345.00 |
| 25 | 4.80 | 76.3 | 650.00 |
| 40 | 7.23 | 61.6 | 1,126.00 |

Since the Vocational and Part Time Schools are of recent organization, complete reports of expenditure are hard to secure. A few are given here:

| Number of School | Cost Per Pupil Per Month | Per Cent for Teaching and Supervision | Equipment Per Pupil |
|---|---|---|---|
| 19 | $5.65 | 79.0 | $48.30 |
| 28 | 19.34 | 83.0 | |
| 30 | 9.28 | 70.2 | 20.00 |
| 44 | 13.33 | 78.6 | |
| 46 | 1.12 | 67.8 | 36.60 |

## Disposition of School Products

One of the factors in an industrial school that affects materially the cost of maintenance is the nature of the product made in the school and the manner of its disposal. In the technical and manual training schools there is a tendency to let the pupils pay for the material and take the product. In the trade and intermediate vocational schools an attempt is usually made to approach shop conditions in which material and workmanship are the same as in shops and factories and in which the product is sold in competition with factory products.

The following table shows the various ways in which the problem is handled in the different schools.

| Number of Schools | Disposition of Product |
|---|---|
| 14 | Product given to pupils. |
| 1 | Nothing sold. |
| 3 | Sold in open market. |
| 7 | Used in school. |
| 2 | Thrown in scrap heap. |
| 4 | Materials paid for and product taken by pupils. |

Those that consigned the product to the scrap heap had in general materials that could be used over again, such as plumbing material, steam fittings, brick, etc.

## Variety of Courses of Study Offered by the Schools Represented in This Report

One is surprised at the great variety of different types of industrial activity that are represented in the industrial schools of the United States. The following table is compiled from the schools represented in this report and is given that the reader may secure easily and quickly some idea of the scope of industrial instruction.

| Subject | Industrial Work Frequency | Supplementary Work Frequency |
|---|---|---|
| *Drawing* | | |
| 1 Mechanical | 15 | 1 |
| 2 Art Design | 3 | 2 |
| 3 Pattern and Estimating | 1 | |
| 4 Free Hand Drawing | 1 | |
| 5 Design for Textiles | 3 | |
| 6 Architectural | 6 | |
| 7 Machine Design | 2 | |
| *Wood Working* | | |
| 8 Joinery | 32 | |
| 9 Carpentry | 11 | |
| 10 Cabinet Making | 9 | |
| 11 Framing | 3 | |
| 12 Carving | 2 | |
| 13 Pattern Making | 26 | |
| 14 Crafts | 1 | |
| *Metal Working* | | |
| 15 Machine Shop | 25 | |
| 16 Tool Making | 5 | |
| 17 Die Making | 1 | |
| 18 Light Iron Work | 2 | |
| 19 Forging | 14 | |
| 20 Blacksmithing | 3 | |
| 21 Founding | 8 | |
| 22 Sheet Metal | 7 | |
| 23 Cornice and Skylight | 1 | |
| 24 Steam Fitting | 2 | |
| 25 Plumbing | 10 | |
| 26 Instrument Making | 1 | |
| *Engineering* | | |
| 27 Electrical | 1 | |
| 28 Steam | 3 | |
| 29 Gas | 1 | |
| 30 Operating Steam | 1 | |
| *Electricity* | | |
| 31 General Electricity | 3 | |
| 32 Wiring | 3 | |
| 33 Practical | 1 | |

| | Subject | Industrial Work Frequency | Supplementary Work Frequency |
|---|---|---|---|
| *Masonry* | | | |
| 34 | Tile Setting | 1 | |
| 35 | General Masonry | 1 | |
| 36 | Brick Laying | 10 | |
| 37 | Plastering | 4 | |
| *Academic Work* | | | |
| 38 | Arithmetic | | 8 |
| 39 | Algebra | | 4 |
| 40 | Geometry | | 2 |
| 41 | Trigonometry | | 4 |
| 42 | English | | 3 |
| 43 | Grammar | | 1 |
| 44 | History and Civics | | 1 |
| 45 | Geography | | 2 |
| 46 | Chemistry | 2 | 5 |
| 47 | German | | 1 |
| 48 | Mechanics | | 1 |
| 49 | Physics | | 4 |
| *Household Arts* | | | |
| 50 | Sewing | 23 | |
| 51 | Cooking | 19 | |
| 52 | Millinery | 12 | |
| 53 | Dress Making | 9 | |
| 54 | Laundrying | 1 | |
| 55 | Housekeeping | 1 | |
| 56 | Hand Machine Sewing | 1 | |
| *Horology* | | | |
| 57 | Jewelry | 1 | |
| 58 | Optics | 1 | |
| 59 | Watch Making | 1 | |
| *Textiles* | | | |
| 60 | Tailoring | 1 | |
| 61 | Button Hole Making | 2 | |
| 62 | Cotton Spinning | 1 | |
| 63 | Wool Spinning | 1 | |
| 64 | Worsted Weaving | 1 | |
| *Art Work* | | | |
| 65 | Sign Painting | 3 | |
| 66 | Art Leather | 1 | |
| 67 | Clay Molding | 2 | |
| 68 | Plaster Casting | 1 | |
| 69 | Stone Cutting | 2 | |
| 70 | Painting and Decorating | 11 | |
| 71 | Free Hand Drawing | 1 | |
| *Automobile Work* | | | |
| 72 | Automobile Management | 2 | |
| 73 | Chauffeuring | 1 | |
| 74 | Automobile Body Work | 1 | |
| 75 | Automobile Painting | 1 | |

| | Subject | Industrial Work Frequency | Supplementary Work Frequency |
|---|---|---|---|
| *Miscellaneous* | | | |
| 76 | Hygiene and Sanitation | 4 | |
| 77 | Printing | 1 | |
| 78 | Agriculture | 3 | |
| 79 | House Painting | 1 | |
| 80 | Book Binding | 1 | |
| 81 | Gasoline Engine Practice | 2 | |

## Some General Observations

With the present state of knowledge and school organization comparison of one school with another is not possible as schools differ so widely. However, a few general tendencies may be pointed out.

We can say that the median cost of industrial education is $4.80 per pupil per month with a variation of 126 per cent of the median. In general the proportion devoted to teaching and supervision is nearly the same as in the common schools, being about 73 per cent of the total expenditure. There is a greater variation in cost per pupil in the industrial schools than in the common schools. There is a greater diversity of subject matter in the industrial schools, the table showing that there are about 80 different subjects represented in this report.

To be able to secure accurate, complete information, better methods of bookkeeping will have to be introduced. Schools should be able to distinguish between salaries paid to teachers and to janitors, and where schools are a part of a city system there should be methods by which the expenditures of one school may be distinguished from those of the others.

There also should be established some standard form of making reports so that there will be some common basis of comparison among the various schools. Under such a system, for example, there would be no occasion for reporting 45 per cent of the budget as miscellaneous expenditure.

As schools differ radically in organization and function specific data on the separate courses would be very valuable, especially to those contemplating the introduction of new lines of work in connection with their schools already established. Data of

each department together with the data on general maintenance should be accurate and reliable. Although this study is incomplete and, in a number of particulars, only of relative accuracy, it may be of value in pointing out tendencies.

## SCHOOL OF INDUSTRIAL ARTS

The SCHOOL OF INDUSTRIAL ARTS is devoted to the technique of fundamental processes in industries and commerce and to the study and practice of the educational method of these subjects in schools of various types and grades. While primarily an institution for training teachers, it also offers preparation for service in commerce and industry. The scope of the School is indicated by the following statement of its courses, curricula and equipment, and by the illustrations following.

### COURSES OF INSTRUCTION

The courses in the SCHOOL OF INDUSTRIAL ARTS, which number sixty-four and require an instructing staff of forty-six persons, are grouped as follows:

(1) **Industrial Arts Education:** .Seven courses in Psychology, History, and Principles of Education, Principles and Practice of Teaching Industrial Arts, Elementary School Teaching, Secondary and Trade School Teaching.

(2) **Drawing and Design:** Fourteen courses in Mechanical Drawing, Perspective, Architectural Drafting, Industrial Art Design, Lettering, and Design of Steel and of Reinforced Concrete Structures.

(3) **Industrial Mathematics:**. Nine courses in Shop and Commercial Mathematics, Algebra, Geometry, Trigonometry, Analytics, Calculus, Surveying.

(4) **Wood-working:** Five courses in Wood-working, Cabinet Work, Turning and Pattern-making, Wood Carving, Technology of Wood-working.

(5) **Metal Working:** Six courses in Moulding, Foundry, Forging, Machine Shop, Hand-wrought Metal and Enamel.

(6) **Ceramics:** One course in Pottery.

(7) **Photography:** Two courses in Art Photography.

(8) **Bookbinding:** Courses in Paper and Cardboard Construction and Bookbinding.

(9) **Library Economy:** One course in elementary library methods.

(10) **Industries:** Seven courses in Modern Industries, Textiles and Plant Management.

(11) **Industrial Science:** Five courses in Industrial Chemistry, Physics, Electricity.

(12) **Commercial Education:** Ten courses in Office Practice, Business Organization and Administration, Accounting, Stenography,

Typewriting, Commercial Law, Industrial History, Commercial English.

### Curricula in Industrial Arts

Students may register, according to their qualifications, in the following curricula in the School of Industrial Arts:

(1) **The degree of Doctor of Philosophy and the Doctor's Diploma in Education,** with a major in industrial arts, open to college graduates only. Requires three years.

(2) **The degree of Master of Arts and Master's Diploma in Education,** with a major in industrial arts; open to college graduates only. Requires one year usually.

(3) **The degree of Bachelor of Science and Bachelor's Diploma in Education,** with a major in industrial arts. Open to students who have done two years' work, subsequent to the high school, in normal school, college, or technical school. Such students follow a two-year curriculum in industrial arts, together with additional elective courses.

(4) **The Special Diploma for Teaching Industrial Arts.** Open to teachers who wish special training for the teaching of industrial arts, who are not able to meet fully the requirements of previous training under (3); the two-year curriculum outlined under (3) is followed.

(5) **The Special Certificate for Teaching in Industrial and Trade Schools.** Open to expert mechanics and craftsmen who desire to become teachers of shop-work. For these a special one year's program of full college work or a three years' program of night work is arranged.

(6) **The Bachelor's Degree and Diploma in Teaching Commercial Arts.** A two-year course, with the same requirements as (3) and (4), respectively, above, but with a two-year curriculum in commercial arts and related subjects.

(7) **The Special Certificate in Teaching Commercial Arts.** Open to teachers and commercial workers unable to meet the requirements for the diploma (6).

(8) **The Special Certificate in Applied Arts.** A two-year course, open to students who have had full secondary education; this diploma qualifies for admission as candidate for a special diploma and the bachelor's degree and diploma (see above).

(9) **The Special Certificate in Drafting.** A two or three-year course of evening study open to those who wish to qualify for positions as mechanical or structural draftsmen.

(10) **The Special Certificate for Clerical Work.** A one-year course open to high school graduates who wish to qualify as clerical and administrative assistants.

(11) **Evening Technical Courses** in Industry and Commerce are given at night and are open, without examination, to men and women who desire to obtain higher technical knowledge in their callings.

(12) **Special students,** not candidates for degrees, diplomas or certificates, may be received for any special subject or group of subjects.

## Equipment

The School of Industrial Arts occupies the Macy Memorial Building, five stories in height, erected at a cost of over $250,000 and devoted exclusively to the purposes of the School of Industrial Arts and related instruction in the Fine Arts. New equipment has just been added, at an expense of $10,000, making the facilities complete for the fields covered. Details of various departments follow:

(1) **Forge:** Twenty forges with anvils, tools and vices, a 30-pound Bradley power hammer and a 400-pound Billings & Spencer drop-press.

(2) **Foundry:** Molding benches for twenty students and necessary tools for all kinds of bench work in snap flasks, floor molding, loam work, and the application of sweeps to the making of molds, together with melting pits for the melting of brasses and bronzes and a cupola for melting cast iron.

(3) **Machine Shop:** Lathes, swinging from twelve to twenty inches, planers, drill-presses, Universal milling machines and grinding machines, with examples of direct-connect motor and belt drives for each, including Jones & Dawson flat turret lathe, Warner & Swasey screw machine, five Hendy motor-driven lathes, Hendy universal milling machine, Cincinnati 16-inch shaper. In conjunction with the shops there is a well-equipped tool-room. The attendance record is kept by a timekeeper's recording clock, and the organization and atmosphere of an industrial shop are aimed at.

(4) **Wood-Working:** Individual benches with complete equipment of wood-working tools. Power equipment consisting of the following motor-driven machines: Oliver lathe, jointer and saw-table, Greenlee mortiser and grinder. Appliances for polishing and finishing. A completely equipped carpenter shop is also available for special projects.

(5) **Wood-Turning and Pattern-Making:** Benches for joinery and pattern making with the necessary hand tools and individual speed lathes for wood turning, a motor-head speed lathe of large size, 36-inch band saw and trimmers of the most recent type. There are also available for working up stock and special projects a saw bench, surfacer, jointer, mortising machine, all of the latest type.

(6) **Silversmith and Metal-Work:** Twenty benches equipped with complete equipment of tools, blow pipes, etc., for individual work in jewelry making, and projects in art-metal work. Motor-driven machines for drilling and polishing, furnaces, and special equipment for etching and finishing.

(7) **Metal-Working Room:** Equipment for larger and heavier projects than those just outlined. The equipment includes individual outfits and power and other large apparatus, for plating, annealing, etc.

(8) **Drafting:** Drawing tables, boards, etc., for sections of 40 students, with full collection of geometrical models, valves, and other types of machine parts.

(9) **Photography:** Two dark rooms—one for individual work, and one for class work—equipped with Cooper-Hewitt light, lantern slide camera, enlarging camera, and other appliances for bromide-process work and other divisions of photography.

(10) **Ceramics:** Pottery room with equipment for individual work, potter's wheel, kiln, etc.

(11) **Textile Laboratory:** Thirty desks for work in dyeing, chemistry and microscopy of textiles; hand looms for illustrative weaving.

(12) **Physics, Chemistry, and Electricity:** The laboratories of Teachers College offer full facilities for instruction in these subjects.

(13) **Book-binding and Library Economy:** The Bryson Library is available to students in library economy for observation and some practice work. In book-binding, equipment suitable for school work is provided, including work tables, cutters, presses, etc.

(14) **Industrial Arts Library:** A collection of books and periodicals relating to the Industrial Arts and Industrial Arts Education, is located in the adjoining building. The Bryson Library of Teachers College is fully available, and the University Library for advanced students.

### Information

Catalogues and further information regarding the School of Industrial Arts will be sent on application to The Secretary, Schools of Industrial and Household Arts, Teachers College, Columbia University, New York City.

## THF SCHOOL OF HOUSEHOLD ARTS

The School of Household Arts of Teachers College has as its field the arts and sciences concerned in the conduct of the home, the hospital, the institutional household, and related vocations, and the educational courses related to instruction in these subjects. Students who desire may prepare themselves to teach household arts or branches thereof in schools of various types and grades. As a technical school, The School of Household Arts offers the training necessary to persons engaged in, or wishing to prepare for the various occupations other than teaching represented in the activities of the School. The scope of the School is best indicated by the following statement of its courses, curricula and equipment:

### Courses of Instruction

The courses in The School of Household Arts, which number eighty-eight and require an instructing staff of fifty-eight, are grouped as follows:

(1) **Household Arts Education:** Six courses in Psychology, History of Education, Principles of Teaching, Teaching of Household Arts, Supervision and Critic Teaching in the Household Arts, Practicum in Household Arts.

(2) **Nurses Education:** Four courses in Teaching in Training Schools for Nurses, History of Nursing, Training School Administration, Nurses Education.

(3) **Nutrition:** Nine courses in Elementary Food Economics, Dietary Administration, Dietetics, Nutrition.

(4) **Household Chemistry:** Three courses in Food Production and Household Chemistry.

(5) **Physiological Chemistry:** Three courses in Physiological Chemistry and Sanitary Chemistry.

(6) **Foods and Cookery:** Nine courses in Food Preparation, Experimental Cookery, Home Cookery, Demonstration Cookery, Cookery for Invalids, Institutional Cookery, Lunch Room Cookery, Catering, and History of Cookery; and nine "special class" courses.

(7) **Textiles and Clothing:** Seven courses in Elementary Clothing, Shirt-waists, Dressmaking, Dressmaking Shopwork, History of Costume, Organization of Dressmaking Establishments, Millinery, and Embroidery; and six "special class" courses.

(8) **Household Arts—Fine Arts:** Five courses in House Structure, Household Art Design, Household Furnishings.

(9) **Costume Design:** Six courses in Costume Design and History of Costume.

(10) **Household Administration:** Eight courses in Household Physics, Household Management, Housewifery, Marketing, Domestic Laundering, Institutional Laundries, Home Nursing and Emergencies, Institutional Administration.

(11) **Nursing and Health:** Nine courses in Materia Medica, Hospital Construction, Hospital Organization, Hospital Administration, School and Municipal Nursing; eight courses in District Nursing, Municipal Sanitation, Industrial Hygiene, Public Health Problems, Care of Infants and Small Children.

(12) **History, Economics and Sociology:** Four courses in History of the Household, Household Economics, Elements of Sociology and Social Progress.

### Curricula in Household Arts

Students may register according to their qualifications and purpose in the following curricula in The School of Household Arts:

(1) **The degree of Doctor of Philosophy and Doctor's Diploma in Education** with a major in Household Arts. Open only to college graduates and requires three years usually.

(2) **The degree of Master of Arts and Master's Diploma in Education** with a major in Household Arts. Open only to graduates; requires one year usually.

(3) **The Bachelor of Science degree and Bachelor's Diploma in Education** with a major in one of the following divisions of Household Arts: Household Arts Education, including Teaching Household

Arts in Elementary and Secondary Schools, and Supervision of Household Arts; Trade Education for Women, including Teaching in Industrial and Trade Schools, and Supervision of Trade and Industrial Education for Women, Nurses Education, Household Administration, and Dietetics. A two-year curriculum, open to students who have already had a two-year curriculum subsequent to the high school in normal school, technical school, or college, including required courses stated under one of these major subjects, together with elective courses.

(4) **The Special Diploma of Teachers College** in one of the above mentioned departments of the Household Arts—see (3). A two-year course open to those unable to meet the full academic requirements for admission to (3) above.

(5) **Technical Curricula,** each one or two years in length, lead to special certificates. High school graduation is, in general, required for admission; for certain curricula, additional training or experience. The following curricula are included: Applied Arts, House Decoration, Home Cookery, Institutional Cookery, Costume Design and Fashion Illustration, Dressmaking, Household Management, Laundry Management, Lunch-room Management, Nursery Management, Nurses' Education, School or District Nursing, Nurses' Preparatory Certificate, Sanitary Inspection, Trade Teaching.

(6) **Special Classes** are provided giving practical instruction in Foods, Cookery, Sewing, Dressmaking, Costume Design and other subjects for those who do not wish to become candidates for degrees, diplomas or certificates.

## Equipment

The School of Household Arts has recently occupied the new Household Arts Building, six stories in height, erected at a cost of nearly a half-million dollars, and fully equipped in all respects for instruction and research in various divisions of the Household Arts. Details of the various departments follow:

**Cooking:** Three large laboratories, each equipped with thirty cabinet desks, stoves for individual work, and large kitchen ranges of various types, coal, gas, and electrical; special equipment, refrigerators, etc. Experimental laboratory equipped for problem work, with suitable stoves, utensils, etc. Institutional kitchen comprising a block of typical hotel or institutional apparatus, including broiler, French coal range, gas range, vegetable cooker, soup kettle, steam table, urns, dish-warmer, and refrigerator. Dining room laboratory with facilities for both family and lunch-room problems and service, and for catering. Service rooms and offices are included in the equipment of the Department.

**Household Chemistry:** Main laboratory with desks and individual equipment for sections of thirty students, including glassware, apparatus, lamps, etc.; stock room and instructor's laboratory adjoining. Advanced laboratory with individual desks for fifteen students, and

complete individual equipment; large apparatus, including balances, polariscope, furnace, hoods, etc.

**Physiological Chemistry:** Main laboratory with thirty individual desks with complete equipment and services of hot and cold water, gas, air pressure, and suction; hoods, refrigerators, microscopic apparatus, etc. Advanced laboratory provides for fifteen students, with complete research apparatus. Equipment is also provided for instruction in Sanitary Chemistry.

**Nutrition:** Main laboratory with laboratory desks with stoves, completely equipped for the experimental preparation of food; tables for computation; balances and other apparatus for quantitative work. Advanced laboratory with all necessary research apparatus for investigations, both quantitative and qualitative, in nutritive values, metabolism and dietary studies.

**Textiles and Clothing:** Four large laboratories devoted to hand sewing, millinery, and dressmaking, each suitably equipped with sewing tables and machines and storage lockers. A collection of prints and lantern slides are available to illustrate the history of costume. A store for supplying material to students is provided. Textile laboratory equipped with thirty tables for microscopic and chemical studies of fibres, for dyeing and for illustrative work in weaving.

**Household Art:** Three studios suitably equipped with drawing tables, boards, teaching materials, lantern slides, etc., for instruction in household art design, house furnishings, house decoration, and costume design.

**Household Management:** A laboratory equipped with tables and teaching collections of apparatus and materials necessary for various divisions of house work and management.

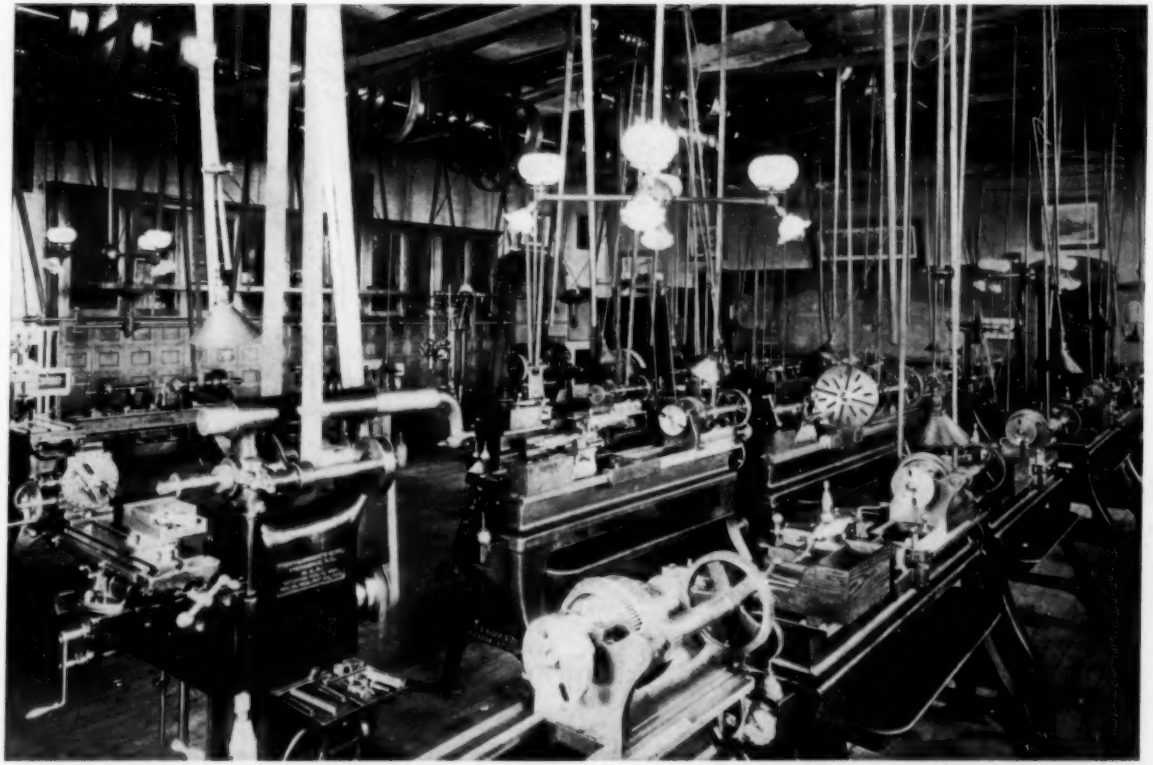
**Laundry:** A laboratory equipped for hand work, with twenty-four set tubs, ironing boards, drying room; and power equipment consisting of wash wheel, extractor, steam mangle, in regular commercial sizes. Chemicals and reagents for treating stains are found in an adjoining laboratory.

**Nursing and Health:** Special lecture and workroom with illustrative collections; special materials for instruction in home nursing and emergencies.

**Household Arts Reading Room:** A special library and periodical collection occupies a large room 30 x 60 on the first floor, forming the centre of instruction in Education, Management, Nursing and Health, and certain other departments. Accessions are constantly being made of new books as published, and materials required for any problems or investigations undertaken by students are provided. One hundred American and foreign periodicals, dealing with the household arts and industrial arts, are on file.

### Information

For announcements or additional information address The Secretary, Schools of Industrial and Household Arts, Teachers College, Columbia University, New York City.



The Machine Tool Shop, Macy Building—School of Industrial Arts

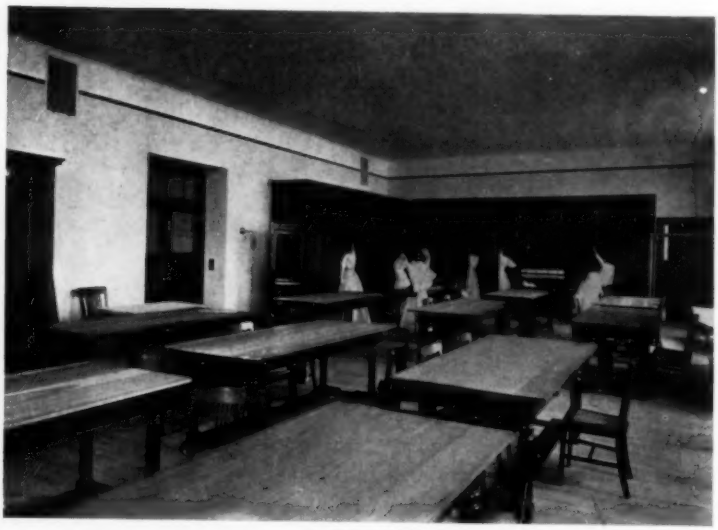
Art Studio—Industrial Arts Building
Chemical Laboratory—Main Building

Physiological Chemistry Laboratory—School of Household Arts

School of Industrial Arts—Forge Shop, Macy Building

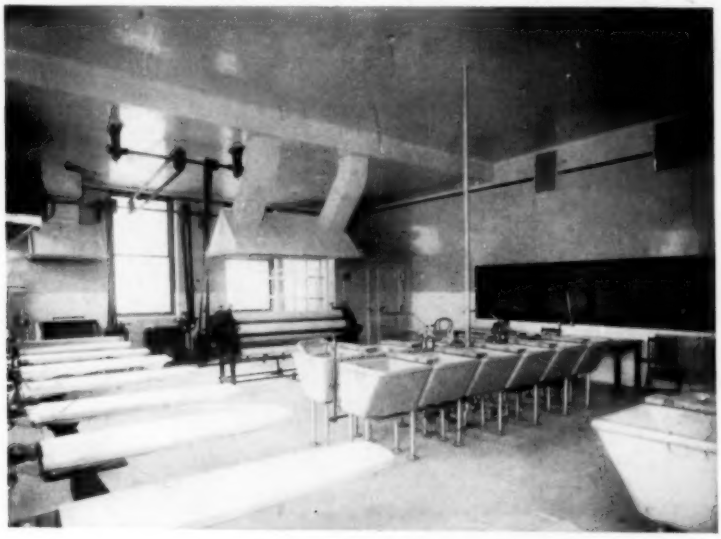
Cooking Laboratory—School of Household Arts

Design Studio—School of Household Arts



Dressmaking Laboratory—School of Household Arts

Wood-Working Shop—School of Industrial Arts



Laundry Laboratory—School of Household Arts

Biology Laboratory—School of Household Arts

Dining Room Laboratory—School of Household Arts

# THE TEACHING OF SPELLING

## A critical study of recent tendencies in method

By HENRY SUZZALLO

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Columbia University

PUBLISHED BY
Teachers College, Columbia University
NEW YORK CITY
1911

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